

Famous protagonists interfere with discourse topicality during pronoun resolution

Petra B. Schumacher, Department of German Language and Literature I, Linguistics, University of Cologne, Germany,
petra.schumacher@uni-koeln.de

Clare Patterson, Department of German Language and Literature I, Linguistics, University of Cologne, Germany,
cpatters@uni-koeln.de

Magdalena Repp, Department of German Language and Literature I, Linguistics, University of Cologne, Germany,
mrepp1@uni-koeln.de

The aim of the current study is to assess the impact of the wider discourse on pronoun interpretation. We specifically look at German demonstrative pronouns (*dieser*) in comparison to personal pronouns (*er*), investigating whether *dieser*-demonstratives are influenced only by factors in the preceding sentence (specifically, sentence topicality) or whether they are additionally influenced by cues from the wider discourse (i.e., discourse topicality). We found that discourse topicality competes with sentence topicality for prominence, when the two cues are not aligned to one and the same referent. This had an impact on referential interpretation of both personal and demonstrative pronouns, with weakened interpretive biases when sentence and discourse topic did not converge on the same referent (Exp. 3). Our data further indicate that the introduction of a protagonist from a well-known novel blocked the emergence of the discourse topic as a prominence-lending cue for personal pronouns (Exp. 1–2). We propose that reference to the famous protagonist triggers a protagonist layer, which introduces its own set of questions under discussion, which in turn invalidates the discourse topic. Crucially, the demonstrative pronoun *dieser* does not consider the protagonist layer and only relies on the discourse layer for interpretation.



1. Introduction

How is prominence in discourse determined? Numerous factors have been considered as potential prominence-lending cues, such as grammatical function, thematic role, linear order or topicality (for an overview, see, for instance, Arnold, 2010; von Heusinger & Schumacher, 2019). Research on English has been largely restricted to investigating these prominence-lending cues through the lens of personal pronoun interpretation. However, personal pronouns are relatively flexible in their referential choices and might thus not be the best test case for an assessment of prominence relations; that is, a personal pronoun can select the most prominent referent, but it can also pick up another referent in the discourse. In contrast, demonstrative pronouns are more restrictive in their referential choices. German has demonstrative pronouns that can be used systematically to refer to an animate or inanimate entity that is not the most prominent entity in the current discourse. In fact, demonstrative expressions have been described as excluding the most prominent entity (Comrie, 1997) and showing an anti-subject bias (Bosch et al., 2007), an anti-topic-bias (Bosch & Hinterwimmer, 2016; Bosch & Umbach, 2007; Wilson, 2009) or an anti-agent bias (Schumacher et al., 2016).¹ In addition, demonstrative pronouns in German show more robust interpretive preferences than personal pronouns (e.g., Patterson & Schumacher, 2021). This makes them good candidates for investigating the contribution of particular features to prominence computation. Here we want to ask how discourse topicality impacts pronoun interpretation.

1.1 Topicality

The term *topic* refers to what a particular segment is about, and there is a distinction between sentence topicality and discourse topicality. Previous research on reference resolution has mainly investigated the notion of sentence topicality (or aboutness topicality; Reinhart, 1981). The *sentence topic* refers to what a sentence is about, while the *discourse topic* indicates what a text is about (van Dijk, 1977; van Kuppevelt, 1995). Both concepts of topicality have received rather distinct characterizations, ranging from an entity to a question under discussion or a proposition (e.g., Asher, 2004; Klein & von Stutterheim, 1987; Reinhart, 1981; van Kuppevelt, 1995). In the current research, we investigate discourse referents (entities) that carry sentence and/or discourse topicality as prominence-lending features. From a cognitive perspective, both kinds of topic shape the internal organization of the discourse representation and serve as anchors for elements in discourse. The sentence topic mainly supports the establishment of coherence between adjacent sentences (see also the backward-looking center in Centering Theory; Grosz et

¹ Note that when we refer to interpretive strategies in a negative way (e.g., anti-topic bias) this is only for reasons of readability. There is evidence from research with contexts that make available more than two referential candidates that demonstrative pronouns do not merely avoid the most prominent entity but that they show gradient interpretive preferences (Patterson & Schumacher, 2021).

al., 1995), while the discourse topic serves a broader discourse-structuring function in identifying the theme of a larger chunk of discourse (such as an entire text, a conversation or maybe a paragraph; see, e.g., van Dijk, 1977, 2014). In addition, the discourse topic also facilitates local coherence between adjacent sentences.

Reinhart (1981) argues that the sentence topic is crucial for information packaging and information storage. Adopting the metaphor of a file card storage system, the sentence topic designates the locus for information storage at the propositional level, while the rest of the sentence encompasses what is said about the topical entity – referred to as the *comment* – and represents information that is stored in relation to the topic. (To stay within the file card imagery: the information in the rest of the sentence, i.e., the comment, is stored on the topic’s file card.) This information-structural division between topic and comment also has consequences for sentence structure, in that topics tend to occur before comments. For main clauses in German, the topic has been claimed to occur in sentence-initial position unless a delimitation or frame setting element (such as a locative or temporal adverbial) is present (Büring, 1999; Frey, 2000; Jacobs, 2001; Speyer, 2008). Sentence topics can be identified by a series of diagnostics: (i) when the sentence is a good answer to the question “What about X_{topic} ?” or is embedded under “S/he said about X_{topic} that ...”; (ii) when the sentence could be paraphrased as “Concerning X_{topic} , ...”, and (iii) when the sentence would be a good response to “Let me tell you something about X_{topic} ” (Götze et al., 2007; Reinhart, 1981).

The discourse topic is also considered central to information storage, but at the global level of the organization of discourse, where relations between propositions or so-called macrostructures are encoded. Van Dijk (1977) claims that the discourse topic represents the entailment of all the propositions of a text. However, from an incremental perspective, this view is not feasible, since discourse structure is built continuously and certain discourse-structuring constraints (e.g., the Right Frontier Constraint; Polanyi, 1985) apply as discourse unfolds. Nonetheless, the central role of the discourse topic is to connect the propositions of a text in a meaningful way. Within the framework of Question Under Discussion (QUD; Klein & von Stutterheim, 1987; Roberts, 2012; van Kuppevelt, 1995; von Stutterheim & Klein, 1989), a discourse topic is defined with respect to the explicit or implicit questions to which a sequence of propositions provides an answer. Other approaches adopt a narrower stance and only consider discourse topicality with certain coherence relations, such as Narration and Continuation² (Asher, 2004). Potential diagnostics for discourse topicality include (i) the answer to the question “What is the larger discourse unit (text, conversation, paragraph, etc.) about?”, (ii) a summary, like “In summary, ...”, and, where applicable, (iii) hints from the title or headings of a text (van Dijk, 2014).

² The coherence relation Continuation connects discourse units that describe an object or an event.

Discourse topicality is considered to be more central to the overall coherence than sentence topicality, because local coherence (partly determined by sentence topicality) does not necessarily make sense without discourse coherence. Evidence for this comes from studies that reveal that language comprehension, learning and recall benefit from the availability of the discourse topic (for an overview, see van Dijk, 2014); this has, for instance, been attested for studies manipulating the presence or absence of a title (Bransford & Johnson, 1972; St. George et al., 1994). Following from this, it seems possible that discourse topicality serves as a higher-ranking constraint for language processing – and reference resolution in particular – than sentence topicality. In the following, we will investigate how sentence and discourse topicality interact with each other during pronoun resolution.

Discourse topicality is not the only global discourse-structuring device. Longer texts or spoken discourse require considerations of protagonists and perspectival features but also knowledge based on the genre or world knowledge. Therefore, the QUD may not just be derived from the text itself, but from the larger discourse or background knowledge. Reference to a well-known literary character or story plot may open up an entirely new layer of specific (world) knowledge that triggers a new set of QUDs. For example, reference to Sherlock Holmes can activate the storyline of Arthur Conan Doyle’s fictional detective and address a question such as “What happened to Sherlock?”. In this regard, Zeevat (2004, p. 210) points out that protagonists play a pivotal role in the organization of discourse and may even be “more than just topical in the discourse”. Similarly, perspectival and attitudinal knowledge may provide a new stance on a situation and trigger a QUD such as “What is the perspectival center’s attitude towards the propositional content?” The presence of a perspectival center has been shown to affect reference resolution (e.g., Hinterwimmer, 2019; Sells, 1987).

In order to establish a more formal differentiation between these different sources that shape discourse organization, we suggest that QUDs can have separate origins that are anchored in distinct worlds or layers of representation. On the one hand, the text serves to answer a set of QUDs, including the discourse topic (the discourse layer). On the other hand, famous protagonists or story themes that are rooted in world knowledge may be activated alongside the unfolding discourse, and we will refer to this additional representation as the *protagonist layer*. This protagonist layer is closely tied to the world of fiction. The processing of fictional names has been described with respect to the attitude of imagination, i.e., introducing Sherlock Holmes as a detective triggers an update of an imaginative world (Maier, 2017). One way to formalize the notion of the protagonist layer is to assume that the discourse layer contains an anchor that points to a fictional world and thereby triggers the introduction of the protagonist layer. Similar accounts have been proposed to formalize perspective-taking, where perspectival centers serve as anchors for mental representations in free indirect discourse and where perspectival center and narrator are associated with different layers of the discourse (Altshuler & Maier, 2020; Bimpikou, 2020; Hinterwimmer, 2019).

How these layers interact with each other is not well understood, but it appears that adding extra layers generates constraints (see the discussion of Patil et al., 2023, below for an example from pronoun resolution). If two layers, for instance, the discourse layer and the protagonist layer, are active simultaneously when reference is made to fictional names, this may have consequences for discourse processing and reference resolution. We investigate this in the following series of experiments.

1.2 Demonstrative pronouns

Unlike English *this* and *that*, German demonstrative pronouns can refer to animate entities. This makes them good candidates to use to investigate the contribution of different prominence-lending cues without having to factor in animacy as a potential cue. German has two types of demonstrative pronouns (*der*, *die*, *das* and *diese*, *dieser*, *dieses*), but we are not concerned with their different functions here (Fuchs & Schumacher, 2020; Hinterwimmer & Patil, 2022; Patil et al., 2020, 2023; Patterson & Schumacher, 2021). Instead, in the current investigation, we assess only the demonstrative pronoun *dieser* in comparison to the personal pronoun. The demonstrative pronouns contrast with the personal pronouns in displaying distinct interpretive biases. Take, for instance, (1). The personal pronoun *er*, albeit flexible in its referential resolution, typically shows a preference for the first-mentioned sentence topic of the context sentence (*the villain*), which is also the subject and agent in this context. The demonstrative pronoun *dieser*, in contrast, has a strong preference for rejecting the first-mentioned sentence topic and selecting the second-mentioned object/patient as its antecedent (*Holmes*). Its biases are more rigid than those of the personal pronoun.

- (1) Der Bösewicht ging augenblicklich auf Holmes los.
 the.NOM villain went immediately on Holmes.ACC off
 Er/Dieser hatte bereits seine Waffe gezückt.
 he/he.DEM.NOM had already his weapon drawn
 ‘The villain immediately went after Holmes. He/He(DEM) had already drawn his weapon.’

The demonstrative pronoun *dieser* has been characterized in grammars as referring to the last-mentioned entity (Zifonun et al., 1997). However, empirical evidence does not support a strict recency explanation and suggests that other factors, like agentivity and perspectival anchoring, also contribute to referential resolution of this type of pronoun (Fuchs & Schumacher, 2020; Patil et al., 2023; Patterson & Schumacher, 2021). Overall, demonstrative pronouns in German have been shown to disfavor the most prominent candidate in the current discourse, where prominence has been associated with subjecthood, proto-agentivity, sentence-topicality, perspectival anchoring and order of mention (e.g., Bader & Portele, 2019; Bosch & Hinterwimmer, 2016; Bosch et al., 2007; Patil et al., 2023; Schumacher et al., 2016; Wilson, 2009). Similar findings have been reported for other languages as well (e.g., Kaiser & Trueswell, 2004, 2008).

In some of these studies, the different prominence-lending features converged on the same antecedent expression, so that it was not possible to tease them apart. Furthermore, in most of the experimental research on reference resolution, short texts consisting only of a context sentence and a target sentence containing the pronoun have been used. Investigating discourse topicality, however, requires us to develop more elaborate discourse scenarios in which distinct discourse and sentence topics are established. We therefore utilize brief stories in the following experiments that allow us to distinguish between discourse and sentence topics, and we also vary the availability of fictional protagonists.

In a series of three experiments, we investigate how discourse topicality influences the interpretation of the personal and the *dieser*-demonstrative pronoun and how it contributes to the establishment of prominence relations. We focus on *dieser* because it has been suggested that this form is the preferred demonstrative pronoun in the written modality (Bader et al., 2022; Weinert, 2007) and in more formal and ‘literary’ text (Patil et al., 2020; Wiemer, 1996). Discourse topics are considered to be good antecedents for personal pronouns (Asher, 2004). From the perspective of discourse representation, they should be the most accessible entities, because they represent the driving force for the information exchange and are the anchor for incoming information. They also have been claimed to dominate sentence topics (van Kuppevelt, 1995).

We further investigate the special contribution of protagonists to referential interpretation and how sets of discourse layers are dynamically interwoven with each other. A relevant previous finding in this regard comes from the influence of the perspectival center on the resolution of demonstrative pronouns. Patil et al. (2023) compared evaluative utterances that expressed the thoughts and attitude of a perspective holder (2a) with neutral utterances (2b). While (2b) represents a neutral comment on Volker’s habits, (2a) brings the speaker to the fore by voicing their positive evaluation of Volker, and thus anchoring the statement to the speaker as the perspectival center. Hence, in (2a) but not in (2b), a perspectival center is required to link the utterance to the evaluator or attitude holder. The study demonstrated that the *der*-demonstrative considers the attitude holder as a maximally prominent referential candidate, i.e., avoids it as a referential candidate in favor of the next prominent candidate. Hence, the evaluative utterance (2a), in which the demonstrative refers to the sentence topic *Volker* (and rejects the maximally prominent perspective holder), was rated better than the neutral utterance (2b), for which the sentence topic is the most prominent entity. In contrast, the demonstrative pronoun *dieser* is not sensitive to the presence of the perspectival center and only considers the local referents, which is reflected in no difference between the ratings of (2a) and (2b).

- (2) Volker brachte Anja einen Donut aus der Bäckerei.
 Voker.NOM brought Anja.DAT a.ACC donut from the.DAT bakery
 ‘Volker brought Anja a donut from the bakery.’

- a. Der/Dieser ist wirklich ein fürsorglicher Mensch!
 he.DEM.NOM/he.DEM.NOM is really a.NOM caring human!
 ‘He(DEM)/He(DEM) really is a caring person!’
- b. Der/Dieser wollte immer etwas Neues beim Bäcker
 he.DEM.NOM/he.DEM.NOM wanted always something new at-the.DAT bakery
 aussuchen.
 choose
 ‘He(DEM)/He(DEM) always wanted to choose something new at the bakery.’

Pursuing the notion of different layers, this suggests to us that *dieser* does not take the presence of the perspectival layer into account, and only considers the local cues in the discourse layer. This, in turn, generates predictions for our investigation of famous protagonists. As suggested above, the presence of a famous protagonist may affect discourse organization (Zeevat, 2004) and yield a conflict between the QUD of the protagonist layer and that of the discourse layer. This hypothesis is explored in the comparison of Experiments 1 and 2 (presence of famous protagonist) vs. Experiment 3 (absence of famous protagonist).

2. Experiment 1

Experiment 1 sought to investigate the impact of the discourse topic on the resolution preferences for the personal pronoun and the demonstrative pronoun *dieser* in German. We operationalized the notion of discourse topic by introducing the respective referent at the beginning of the text as a single protagonist and repeatedly referring to it throughout the story. We further manipulated whether or not the discourse topic matched the sentence topic of the penultimate sentence (i.e., the sentence before the critical pronoun was presented; see examples (3) and (4), respectively).

(3) Discourse Topic = Sentence Topic

^{s1}Hastig rannte **der Bösewicht** die Baker Street entlang. ^{s2}Er war sich sicher, dass er verfolgt wurde. ^{s3}Endlich würde sich das langjährige Ausdauertraining bezahlt machen. ^{s4}Doch am Ende der Straße wurde ihm klar, dass er reingelegt wurde und die Verfolgungsjagd nicht gewinnen würde. ^{s5}Mit wackligen Knien lief er auf das Ende der Straße zu, wo er bereits erwartet wurde.

^{s1}‘Hastily, **the villain** ran along Baker Street. ^{s2}He was sure that he was being followed. ^{s3}Finally, his years of endurance training would pay off. ^{s4}But at the end of the street, he realized that he was being set up and would not win the chase. ^{s5}With shaky knees, he ran toward the end of the street, where he was already expected.’

^{s6}[**Der Bösewicht**]_{REF1} ging augenblicklich auf [Holmes]_{REF2} los.
 the.NOM villain went immediately on Holmes.ACC off
^{s6}‘ [**The villain**]_{REF1} immediately went after [Holmes]_{REF2}.’

^{s7}Er/Dieser hatte bereits seine Waffe gezückt.
 he/he.DEM.NOM had already his weapon drawn
^{s7}'He/He(DEM) had already drawn his weapon.'

(4) **Discourse Topic ≠ Sentence Topic**

^{s1}Hastig rannte **Holmes** die Baker Street entlang. ^{s2}Er war sich sicher, dass er verfolgt wurde. ^{s3}Endlich würde sich das langjährige Ausdauertraining bezahlt machen. ^{s4}Doch am Ende der Straße wurde ihm klar, dass er reingelegt wurde und die Verfolgungsjagd nicht gewinnen würde. ^{s5}Mit wackligen Knien lief er auf das Ende der Straße zu, wo er bereits erwartet wurde.

^{s1}'Hastily, **Holmes** ran along Baker Street. ^{s2}He was sure that he was being followed. ^{s3}Finally, his years of endurance training would pay off. ^{s4}But at the end of the street, he realized that he was being set up and would not win the chase. ^{s5}With shaky knees, he ran toward the end of the street, where he was already expected.'

^{s6}[**Der Bösewicht**]_{REF1} ging augenblicklich auf [Holmes]_{REF2} los.
 the.NOM villain went immediately on Holmes.ACC off
^{s6}'[**The villain**]_{REF1} immediately went after [Holmes]_{REF2}.'

^{s7}Er/Dieser hatte bereits seine Waffe gezückt.
 he/he.DEM.NOM had already his weapon drawn
^{s7}'He/He(DEM) had already drawn his weapon.'

We created brief stories on the basis of three well-known novels featuring Harry Potter, Sherlock Holmes and Winnetou (a German best-seller by Karl May), where the central character of the story and, hence, the discourse topic was either one of the famous protagonists of these stories (e.g., Sherlock Holmes in (4)) or a less specified individual (*the villain* in (3)). The last sentence of each story contained a personal or demonstrative pronoun, and in a forced-choice task, participants were asked to indicate who the pronoun referred to. To ease reference to the famous protagonist, participants were told that they were going to read short excerpts inspired by these three novels, and the stimuli were presented in three blocks, one per novel.

Previous research from pronoun resolution suggests that following a canonical sentence presented in isolation such as S6 above (*The villain immediately went after Holmes.*), the personal pronoun should pick up the first referent (*the villain*) and the demonstrative pronoun should select the second referent (*Holmes*) on the basis of sentence topicality. However, this research did not test the impact of discourse topicality. Given the central role of discourse topics for discourse representation structure, we test the hypothesis that discourse topicality and sentence topicality compete with each other during the establishment of prominence relations. Hence, the preference for interpreting the demonstrative pronoun with respect to the locally less prominent entity (i.e., the anti-topic bias) should decrease if that referent is the globally most prominent discourse topic. Preferences for the personal pronoun should also be lowered when sentence

and discourse topic do not converge on the same entity. A logically possible stronger hypothesis would be that discourse topicality outranks sentence topicality, rendering the discourse topic the most prominent referential candidate. As a consequence, the personal pronoun, which has an affinity with the most prominent entity, should show an interpretive bias towards the discourse topic (*the villain* in (3) and *Holmes* in (4)), while the demonstrative pronoun is expected to exclude the most prominent entity as an antecedent, thus preferring *Holmes* in (3) and *the villain* in (4). However, this strong hypothesis seems unlikely, given that prominence relations are dynamically updated as discourse unfolds, lending attention to local prominence-lending cues and relying on more recent memory representations; therefore, we merely predict the lowered preference for conditions where discourse topic and sentence topic do not converge. Predictions and an analysis plan were pre-registered on aspredicted.org and can be found in the Supplementary Materials.

2.1 Method

2.1.1 Participants

We recruited 111 participants (47 female, 63 male, 1 non-binary) via the platform Prolific (www.prolific.co). We excluded 21 participants from the analysis: 17 participants because they completed the task too fast (cut-off: 10 minutes³), two participants because they identified as early bilinguals, one participant because they did not confirm their status as a native German speaker, and one participant due to a language disorder. The ages of the remaining 90 participants ranged from 18 to 71 years (mean age: 36 years); all reported being native speakers of German. All participants gave written informed consent in compliance with the ethics approval from the Ethics Board of the Deutsche Gesellschaft für Sprachwissenschaft (DGfS). For their participation, they received monetary compensation.

2.1.2 Material

A full list of items can be found in the Supplementary Materials. We constructed short stories about three well-known protagonists: Harry Potter, Sherlock Holmes and Winnetou, and tested four conditions with the factors PRONOUN and DISCOURSE TOPIC. The two factors were fully crossed in order to create the four conditions illustrated in (3/4). The factor PRONOUN has two levels with the personal pronoun (*er*) or the demonstrative pronoun (*dieser*), and refers to the pronoun that appears in the last sentence of the stories. The factor DISCOURSE TOPIC indicates whether referent 1 (REF1) or referent 2 (REF2) from the penultimate sentence was the discourse topic. Note that when DISCOURSE TOPIC = REF1, discourse topic and sentence topic converge, and when DISCOURSE TOPIC = REF2, discourse topic and sentence topic do not converge.

³ In the subsequent experiments, we changed the cut-off to 5 minutes. A post-hoc analysis of Exp.1 with the lower threshold of 5 minutes did not change the results.

Items consisted of six or seven sentences. The first three to four sentences (S1–S4 in the examples above) describe a scene with one prominent character (*the villain* in (3) and *Holmes* in (4)). In the next sentence (S5 in our example), the prominent protagonist realizes that he is not alone, which serves to make the subsequent introduction of the new character more natural. The following sentence (S6) introduces the new character; this sentence always consists of a subject and an object in canonical word order, where the subject (REF1) is always a definite NP and the object (REF2) is the proper name of the prominent protagonist. Non-pronominal forms were chosen for reasons of referential disambiguation. The final sentence (S7) contains an ambiguous pronoun (*er/dieser*) in sentence-initial position. The two final sentences are kept identical across conditions. For each story, one of two familiar protagonists (Harry & Ron, Sherlock & Watson, Winnetou & Karl⁴) were picked as REF2. The definite REF1s of the penultimate sentence were also related to the known story (e.g., Harry Potter: *der Professor* ‘the professor’, *der Hauself* ‘the house elf’; Sherlock Holmes: *der Polizist* ‘the policeman’, *der Bösewicht* ‘the villain’; Winnetou: *der Medizinmann* ‘the medicine man’, *der Häuptling* ‘the chief’). Other prominence-lending cues were kept constant across items, i.e., REF1 was always the subject and agent, while REF2 represented the object and patient. Note that proper names are considered more prominent than definite descriptions (e.g., Ariel, 2001) and the underlying prominence scale (proper name > definite description) is not aligned with the other prominence scales, because REF1 was realized by a definite description and REF2 by a proper name. The transition between the penultimate and final sentence represented a narration or elaboration relation.

There were 12 experimental stimuli in total (four stimuli for each of the three stories Harry Potter, Sherlock Holmes, Winnetou), each in four conditions. These critical items were distributed over four lists in a Latin Square design and were mixed with 18 fillers (six per story). Participants saw each of the 12 items in one condition only, and saw each condition three times. The item presentation was divided by story theme, such that all ten items (experimental and filler) of one story were presented successively as a block, with item order pseudo-randomized. Each block was preceded by an introductory passage in which the story theme (Harry Potter, Sherlock Holmes, Winnetou) and the relevant characters were introduced.

Six of the 18 fillers required an unambiguous referent selection. These fillers served the function of an attention check and were used to exclude participants with two or more errors in these items. Also, 15 fillers contained a feminine anaphor to compensate for the all-masculine pronouns of the experimental stimuli.

⁴ Since the book Winnetou by Karl May is written from a first-person narrator’s perspective, the first name of the author was used as a familiar proper name.

2.1.3 Procedure

The task was forced-choice referent selection, in which participants responded to a question by selecting the referent for the ambiguous pronoun (REF1 or REF2). For instance, for (3/4) the question was: *Who had already drawn his weapon?* Participants completed the questionnaire remotely via the survey platform Qualtrics (Qualtrics, Provo, UT).

2.1.4 Data analysis

Raw data and analysis scripts for this and the following experiments can be found in the Supplementary Materials. All data analysis was carried out in the R programming language (R Core Team, 2019) using RStudio (version 1.4.110; RStudio Team, 2021). The package ‘tidyverse’ (version 1.3.1; Wickham et al., 2019) was used for data processing and visualization, and the package ‘brms’ (version 2.17.0; Bürkner, 2017, 2021) was used for Bayesian regression analysis. We fit a Bayesian model to carry out mixed-effect logistic regression with the *probability of choosing REF2* as the dependent variable.

The model contained the fixed effects DISCOURSE TOPIC and PRONOUN (both sum-coded) and the interaction between these two factors. Item, participant, and story were included as random effects. Specifically, we included by-participant, by-item, and by-story varying intercepts. These random intercepts describe the degree to which particular participants, particular items, or a particular story type led to an overall bias for the selection of REF1 or REF2. In addition, the model included by-participant and by-item random slopes for the sum-coded factors DISCOURSE TOPIC and PRONOUN and their interaction. These random slopes estimate the extent to which specific participants or specific items differ in how they are affected by the discourse topic or pronoun manipulation.⁵

We used weakly informative (default) priors from the package ‘brms’. As an inference criterion, we checked whether the 95% credibility intervals of the posterior distributions for each predictor contained zero. Credible intervals not containing zero were interpreted as strong evidence for the effect of each predictor on the dependent variable. We also checked and report the posterior probability of the estimate being positive or negative given the data ($P(\beta > 0)$) or ($P(\beta < 0)$) (Franke & Roettger, 2019; Nicenboim et al., 2018). Hamiltonian Markov Chain Monte Carlo (MCMC) sampling was conducted with four chains, 8000 iterations (6000 of which were warm-up), resulting in a total of 8000 posterior samples used for inference.

⁵ The model was specified in R as follows: `brm(REF2 ~ discoursetopic * pronoun + (1 + discoursetopic * pronoun | participants) + (1 + discoursetopic * pronoun | items) + (1 | story), data = data, family = "bernoulli", cores = 4, chains = 4, seed = 42, warmup = 6000, iter = 8000, control = list(adapt_delta = 0.99, max_treedepth = 13))`.

2.2 Results

Figure 1 displays the probability of choosing REF2 in the three experiments. The results for Experiment 1 are presented in the left column. When REF1 is the discourse topic of the paragraph (i.e., discourse topic = sentence topic), *er* is interpreted as referring to REF2 in 22.3% of cases and *dieser* in 88.9%. When REF2 is the discourse topic (i.e., discourse topic \neq sentence topic), *er* refers to REF2 in 29.3% of cases and *dieser* in 78.9%.

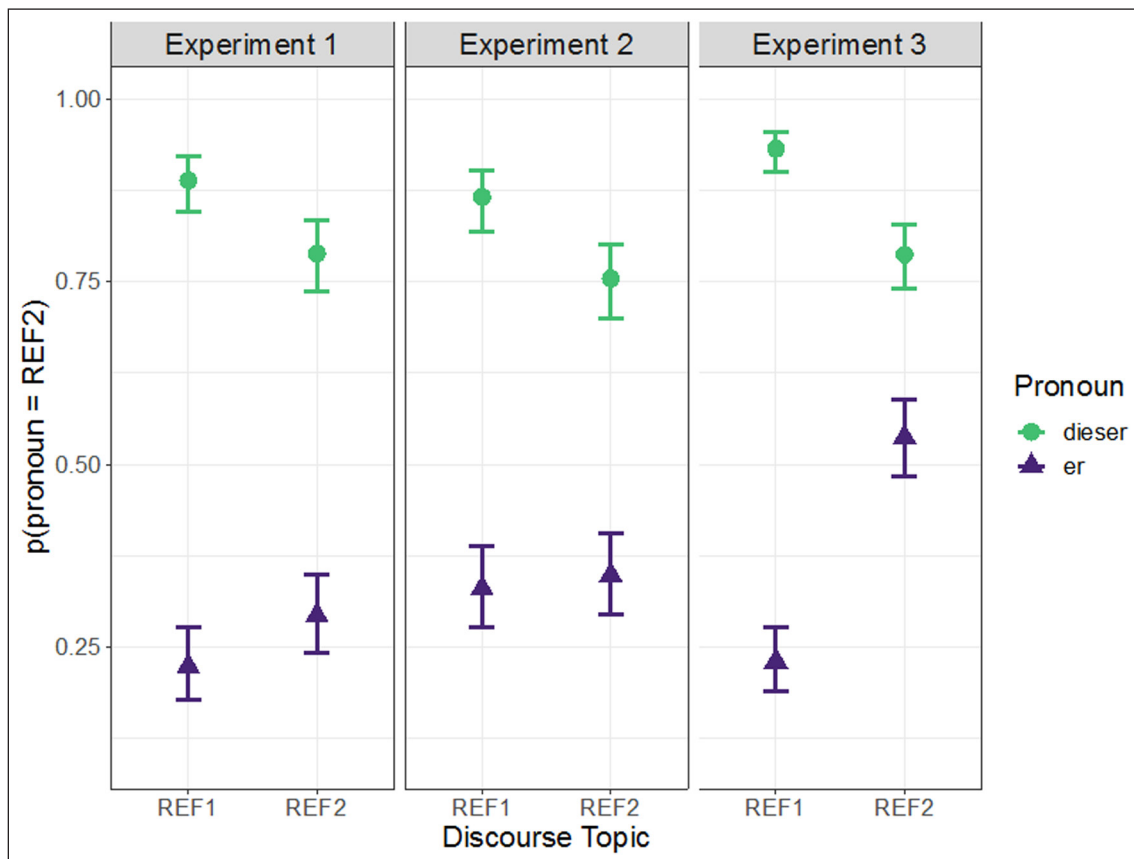


Figure 1: Probability of choosing REF2 in the three experiments. The points indicate the overall proportion of selecting REF2, error bars indicate 95% credible intervals.

The Bayesian mixed effects model caused one divergent transition after warmup. But since all R -hat values = 1.00 and all bulk-ESS and tail-ESS values were very high, a convergence of the model is assumed (Stan Development Team, 2022). The model indicated a positive coefficient for the factor PRONOUN, with a 95% credible interval not containing zero (95% CrI: [1.71, 2.76]) and a posterior probability of $P(\beta > 0) \approx 1.00$, indicating strong evidence for an effect of the pronoun manipulation. This is reflected in the REF1 bias of the personal pronoun and the REF2 bias of the demonstrative pronoun. The factor DISCOURSE TOPIC shows

weaker REF2 preferences for the demonstrative pronoun and stronger REF2 preferences for the personal pronouns in the misalignment case. Due to these opposing directions, the factor DISCOURSE TOPIC did not show reliable evidence for an effect by itself. The 95% credible interval for DISCOURSE TOPIC (95% CrI: [-0.72, 1.05]) contained zero. Also, DISCOURSE TOPIC showed a posterior probability of $P(\beta > 0) = 0.65$. Even though the interaction of DISCOURSE TOPIC and PRONOUN reveals no reliable evidence (95% CrI: [-0.01, 0.69]), indicating a lack of support for an interaction effect, it's worth noting that only a small part of the 95% credible interval extended beyond zero, and the posterior probability was $P(\beta > 0) \approx 1$. Consequently, we assume some degree of evidence for the interaction, leading us to fit separate models for ER and DIESER.

The model for ER did not show a reliable effect for the factor DISCOURSE TOPIC (95% CrI: [-0.37, 0.12]; $P(\beta > 0) = 0.15$), but the model for DIESER revealed a reliable effect for DISCOURSE TOPIC (95% CrI: [0.19, 0.72]; $P(\beta > 0) \approx 1$), which is reflected in lower REF2 preferences when sentence and discourse topic are not aligned.

2.3 Discussion

In Experiment 1, we investigated the role of the discourse topic on referential resolution. We expected to see a change in the interpretive preferences as a function of whether the sentence topic converged with the discourse topic or not. However, the data from the forced-choice referent selection task revealed only a weak interaction effect with discourse topicality that yielded different interpretive preferences for *dieser* but not for *er*. Overall, the interpretive preferences clearly differed by pronoun type: the personal pronoun evoked a pronounced bias toward the sentence topic (REF1), and the demonstrative showed a clear preference for the last-mentioned, non-sentence topic (REF2).⁶ The demonstrative's avoidance of the sentence topic was somewhat compromised when the non-sentence topic represented the discourse topic, yielding lower REF2 preferences for *dieser* (78.9% in the latter case vs. 88.9% when sentence and discourse topic converged). These data support previous research that used much shorter texts and did not manipulate discourse topicality, and found complementary biases for personal and demonstrative pronouns in German (e.g., Bader & Portele, 2019; Bosch & Hinterwimmer, 2016; Bosch et al., 2003, 2007; Fuchs & Schumacher, 2020; Schumacher et al., 2016, 2017; Wilson, 2009). While previous research has mainly looked at the demonstrative pronoun *der*, we present new data on the contrast between *er* and *dieser*, demonstrating complementary behavior during reference resolution for this type of demonstrative pronoun as well.

⁶ Since our critical manipulation is concerned with the role of sentence and discourse topic during pronoun resolution, we only refer to these cues in the discussion. But note that the sentence topic is also the agent, subject and first-mentioned entity.

The absence of a strong interaction effect is surprising, given the central role of discourse topics in other areas of language processing, where they improved recall, comprehension and learning (for an overview, see van Dijk, 2014). However, the impact of discourse topicality may have been weakened by the introduction of a protagonist layer with its own demands for the development of discourse and its independent set of QUDs. As mentioned in Section 1, Zeevat (2004) entertains the idea that protagonists may be more central than the current discourse topic. Building on this, we proposed that an extra protagonist layer can be introduced that competes with the actual discourse layer for QUDs. An open issue is how much information is needed for the protagonist layer to disable or weaken the impact of the discourse topic, and whether the introduction of a protagonist layer is warranted at all. We follow up on these issues in Experiments 2 and 3, respectively.

In Experiment 2, we pursue the idea of a competing protagonist layer further and examine how much cuing is needed to enable the fictional world. In Experiment 1, the participants were instructed that they were reading a story from a well-known novel (e.g., this text is inspired by Sherlock Holmes' detective stories) and were then presented with a block of stories from this genre. In Experiment 2, we implemented a more subtle triggering of the fictional world by removing the story introduction, eliminating reference to the well-known novels, and randomizing the stories, while maintaining the proper names (e.g., *Sherlock*) and a few other subtle pointers in the stories (e.g., *Baker Street*).

In Experiment 3, we assess the processing of discourse topicality in the absence of a fictional world to test an alternative explanation of the data from Experiment 1, according to which the findings may be taken to indicate that local cues (sentence topicality) generally overrule global discourse-structuring cues (discourse topicality). To test this hypothesis, we will deprive the stories of their prominent protagonists (and their concomitant strong associative network).

3. Experiment 2

The mention of a well-known fiction evokes a set of assumptions and may form QUDs that go beyond those addressed by the presented story and its discourse topic. In Experiment 1, the evocation of the fictional world was triggered by an explicit introduction and the presentation of the stories in thematic blocks. Yet, mere mention of the famous character might already activate the fictional world, here referred to as the protagonist layer. This is tested in Experiment 2. We altered stimuli presentation by using a fully randomized presentation of the stories (instead of the block design chosen in Experiment 1), which also rendered the introductory passage with the story theme and central characters unnecessary. If the presentation mode was responsible for generating the effects observed in Experiment 1, i.e., inhibiting the influence of the discourse topic, especially for the personal pronoun, we should observe a more robust interaction of

pronoun type and the factor discourse topic in the absence of the block design. If the proper name in itself has a facilitating effect for the introduction of the protagonist layer, we expect to see a pattern similar to that in Experiment 1, with an effect of pronoun type and a (weak) interaction between pronoun type and alignment of sentence and discourse topic.

3.1 Method

3.1.1 Participants

We recruited 145 participants (113 female, 28 male, 1 diverse, 1 bigender, 2 no answer) from a large lecture of first-year students, who participated for course credit. We had to exclude 54 participants from the analysis: 12 participants did not finish the study, 5 participants were excluded because they finished the questionnaire too fast. Because of the high number of exclusions in Experiment 1, due to too fast completion of the task, in Experiment 2 we changed the cut-off to 5 minutes, which yielded no exclusions. A further 11 participants were excluded because they were not native speakers of German, an additional 14 participants were excluded with a bilingual background, 3 participants due to a language disorder, and 9 participants due to their response to the attention check fillers. The ages of the remaining 91 participants ranged from 18 to 42 years (mean age: 22 years), and all were native speakers of German. All participants gave written informed consent, in compliance with the ethics approval from the Ethics Board of the Deutsche Gesellschaft für Sprachwissenschaft (DGfS).

3.1.2 Material

We used the material of Experiment 1, but the items were not divided into different story settings but presented in a fully randomized order, and no introduction of the famous novel was provided. While the stories are no longer introduced explicitly, the texts may provide additional subtle cues, like *Baker Street* (Sherlock Holmes) or *quidditch game* (Harry Potter).

3.1.3 Procedure

The experimental setup followed the procedures from Experiment 1.

3.1.4 Data analysis

Data analysis of the overall model was the same as in Experiment 1. Additional models for both ER and DIESER were subsequently calculated, modeling the likelihood of choosing REF2 as a referent as a function of the sum-coded factor DISCOURSE TOPIC. Item, participant, and story were included as random effects with by-participant, by-item, and by-story varying intercepts.

3.2 Results

Figure 1 displays the probability of choosing REF2 in Experiment 2 in the middle panel. When REF1 is the discourse topic of the paragraph, *er* is interpreted as referring to REF2 in 33% of cases; when REF2 is the discourse topic, *er* refers to REF2 in 35% of cases. This difference appears to be negligible. With respect to the demonstrative pronoun, *dieser* picks up REF2 in 87% of cases when REF1 is the discourse topic, and REF2 preferences decrease to 75% when REF2 is the discourse topic. There thus seems to be an impact of discourse topic for the demonstrative but not the personal pronoun, similar to the effect observed in Experiment 1.

The Bayesian mixed effects model indicated a positive coefficient for the PRONOUN factor, with a 95% credible interval of [1.15, 2.38] and the posterior probability of $P(\beta > 0) \approx 1$, indicating strong evidence for an effect of the manipulation of referential forms. As in Experiment 1, the DISCOURSE TOPIC factor did not show reliable evidence for an effect in and of itself (95% CrI: [-0.24, 0.74]; $P(\beta > 0) = 0.86$). Also, the interaction of DISCOURSE TOPIC and PRONOUN was not reliable (95% CrI: [-0.02, 0.56]), suggesting that there is no evidence for an effect of the interaction. But since only a small part of the 95% credible interval was beyond zero and the posterior probability was $P(\beta > 0) \approx 1$, we assumed that there was some evidence for the interaction, and hence we fitted individual models for ER and DIESER. This also allowed us to have comparable analyses between experiments.

The model for ER did not show a reliable effect for the factor DISCOURSE TOPIC (95% CrI: [-0.19, 0.25]; $P(\beta > 0) = 0.59$), whereas the model for DIESER revealed a reliable effect for DISCOURSE TOPIC (95% CrI: [0.22, 0.77]; $P(\beta > 0) \approx 1$).

3.3 Discussion

To better understand what caused the patterns observed in Experiment 1, we made the fictional worlds less obvious in Experiment 2 and removed the explicit introductory passage, to avoid establishing an explicit connection to the familiar original novels. At the same time, the stimuli were presented in a randomized manner, making it difficult to deepen the associations with a particular theme as the experiment unfolded. The referential choices revealed competition between sentence and discourse topic when they were associated with different referents. This is reflected in the interpretive preferences for *dieser*: In the cases in which the two topic notions converged (on REF1), the demonstrative pronoun registered an anti-topic bias (REF2 selected in 87% of cases); in the absence of convergence, the competition between the sentence and the discourse topic yielded fewer selections of REF2 (75%). The personal pronoun's preferences were not affected by discourse topicality.

The results for the demonstrative pronoun support the hypothesis that sentence and discourse topic compete with each other for prominence, and that the demonstrative's interpretive preference with respect to the locally less prominent entity (i.e., the anti-sentence-topic bias)

should decrease if that referent is the discourse topic (in line with Experiment 1). In addition, the data indicate that mention of a famous protagonist alone has the same consequences as the more elaborate pointer to the fictional world (introduction and story block) utilized in Experiment 1. Although the influence of the discourse topic is still small, interpretive preferences changed for the demonstrative pronoun, depending on whether the two topic notions were aligned or not. This suggests that world knowledge is able to introduce a protagonist layer, which interacts with the discourse topic and discourse layer in subtle ways. Crucially, the demonstrative pronoun *dieser* appears to be sensitive to the discourse topic, while the personal pronoun *er* appears to be insensitive to the discourse topic manipulation. To investigate whether this difference between the two types of pronouns is linked to the presence of the protagonist layer – in Experiments 1 and 2 implemented via the use of a famous character from a well-known novel – we examine the impact of discourse topicality in the absence of a fictional world in Experiment 3. We test the hypothesis that the distinct sensitivity to the discourse topic of *er* and *dieser* results from the availability of different layers, and the pronoun’s discrete responsiveness to these layers. In essence, we suggest that the demonstrative pronoun is unaffected by information from the protagonist layer, which mirrors findings concerning its insensitivity to the world of the perspective holder (Patil et al., 2023). Accordingly, the demonstrative pronoun only considers the sentence and discourse topics, which are both represented in the discourse layer, but crucially not QUDs from the protagonist layer. Hence, we observed an influence of discourse topicality on the interpretive preferences of *dieser*. In contrast, the personal pronoun is susceptible to both the discourse and the protagonist layer. One way to make sense of the findings from Experiments 1 and 2 is to assume that when QUDs are available from two layers, interpretive biases of the personal pronoun are conferred to the local prominence-lending cue (i.e., the sentence topic). We investigate this assumption in the following experiment.

4. Experiment 3

In this study, we examined what happened to the potentially prominence-lending function of discourse topics if participants were not attuned to a particular story theme, and hence no protagonist layer was projected. Accordingly, the famous proper names in the stories were replaced by generic definite descriptions (e.g., *the policeman* instead of *Holmes*), any potential reference to the story theme (like *Baker Street*) was replaced and the stories were not presented in thematic blocks but in random order. In the absence of a protagonist layer, the discourse topic should be the most prominent entity in discourse for both types of pronouns. We thus assessed again the hypothesis that the two topics compete with each other, resulting in an attenuation of the preferences when discourse and sentence topic are not aligned, as well as the logically possible strong hypothesis, i.e., that the discourse topic supercedes the sentence topic.

4.1 Method

4.1.1 Participants

We recruited 120 participants (72 female, 45 male, 2 non-binary, 1 diverse) via the platform Prolific (www.prolific.co). Seven participants were excluded: 4 participants because they were early bilinguals, one participant due to a language disorder, one participant due to their response to the attention check fillers and one participant because of incomplete data. No participant had to be excluded on the basis of their completion time (cut-off 5 minutes). The ages of the remaining 113 participants ranged from 18 to 57 years (mean age: 27 years), and all were native speakers of German. All participants gave written informed consent, in compliance with the ethics approval from the Ethics Board of the Deutsche Gesellschaft für Sprachwissenschaft (DGfS), and received monetary compensation for their participation.

4.1.2 Material

For Experiment 3, we modified the material of Experiment 2. The structure of the items stayed the same as in previous experiments with one critical change: the proper names referring to prominent protagonists were replaced by a more generic definite description, such as *the policeman* in (4/5). In addition, any other pointers to the known novel were replaced by more neutral terms, such as *Baker Street* from (3/4) to *the avenue* in (5/6). As in Experiment 2, the items were further not divided into different story settings, but presented in a fully randomized order, and no introduction was provided.

(5) Discourse Topic = Sentence Topic

^{s1}Hastig rannte **der Betrüger** die Allee entlang. ^{s2}Er war sich sicher, dass er verfolgt wurde. ^{s3}Endlich würde sich das langjährige Ausdauertraining bezahlt machen. ^{s4}Doch am Ende der Straße wurde ihm klar, dass er reingelegt wurde und die Verfolgungsjagd nicht gewinnen würde. ^{s5}Mit wackligen Knien lief er auf das Ende der Straße zu, wo er bereits erwartet wurde.

^{s1}Hastily, **the imposter** ran along the avenue. ^{s2}He was sure that he was being followed. ^{s3}Finally, his years of endurance training would pay off. ^{s4}But at the end of the street, he realized that he was being set up and would not win the chase. ^{s5}With shaky knees, he ran toward the end of the street, where he was already expected.'

[**Der Betrüger**]_{REF1} ging augenblicklich auf [den Polizisten]_{REF2} los.
 the.NOM imposter went immediately on the.ACC policeman.ACC off
^{s6} '[**The imposter**]_{REF1} immediately went after [the policeman]_{REF2}.'

^{s7}Er/Dieser hatte bereits seine Waffe gezückt.
 he/he.DEM.NOM had already his weapon drawn
^{s7}'He/He(DEM) had already drawn his weapon.'

(6) **Discourse Topic \neq Sentence Topic**

^{s1}Hastig rannte **der Polizist** die Allee entlang. ^{s2}Er war sich sicher, dass er verfolgt wurde.
^{s3}Endlich würde sich das langjährige Ausdauertraining bezahlt machen. ^{s4}Doch am Ende
 der Straße wurde ihm klar, dass er reingelegt wurde und die Verfolgungsjagd nicht
 gewinnen würde. ^{s5}Mit wackligen Knien lief er auf das Ende der Straße zu, wo er bereits
 erwartet wurde.

^{s1}Hastily, **the policeman** ran along the avenue. ^{s2}He was sure that he was being followed.
^{s3}Finally, his years of endurance training would pay off. ^{s4}But at the end of the street, he
 realized that he was being set up and would not win the chase. ^{s5}With shaky knees, he
 ran toward the end of the street, where he was already expected.⁷

^{s6}[**Der Betrüger**]_{REF1} ging augenblicklich auf [den Polizisten]_{REF2} los.
 the.NOM imposter went immediately on the.ACC policeman.ACC off

^{s6}‘[**The imposter**]_{REF1} immediately went after [the policeman]_{REF2}.’

^{s7}Er/Dieser hatte bereits seine Waffe gezückt.
 he/he.DEM.NOM had already his weapon drawn

^{s7}‘He/He(DEM) had already drawn his weapon.’

4.1.3 Procedure

The experimental setup followed the procedures from Experiment 1.

4.1.4 Data analysis

Data analysis of the overall model was the same as in Experiment 1, except that the random effect story was not included, since the items did not manipulate a certain story type. Again, additional models for both ER and DIESER were subsequently calculated as in Experiment 2. Item and participant were included as random effects with by-participant and by-item varying intercepts.⁷

4.2 Results

The right panel of **Figure 1** displays the probability of choosing REF2 in Experiment 3. When REF1 is the discourse topic of the paragraph, REF2 is selected in 23% of cases for the personal pronoun *er*. However, when REF2 is the discourse topic, *er* refers to REF2 in 54% of cases, suggesting a competition between sentence topic (REF1) and discourse topic (REF2). By contrast,

⁷ The model used for the separate analysis of ER and DIESER is shown below. Note that this represents the model for DIESER. The model for ER had the same syntax, except that it was filtered for *er*-data.

```
brm(REF2 ~ discoursetopic + (1 | participant) + (1 | item), data = data[pronoun == "dieser"], family = "bernoulli", cores = 4, chains = 4, seed = 42, warmup = 6000, iter = 8000, control = list(adapt_delta = 0.99, max_treedepth = 13))
```

when REF1 is the discourse topic, *dieser* is interpreted as referring to REF2 in 93% of cases, and when REF2 is the discourse topic, *dieser* selects REF2 in 79% of cases. This reduction of REF2 choices also indicates an interplay of sentence and discourse topic.

The Bayesian mixed effects model indicated a positive coefficient for the PRONOUN factor, with a 95% credible interval not containing zero ([1.34, 3.40]) and a posterior probability of $P(\beta > 0) \approx 1$, indicating strong evidence for an effect of the pronoun manipulation. The model additionally showed a positive coefficient for the interaction of DISCOURSE TOPIC X PRONOUN (95% CrI: [0.83, 1.96], $P(\beta > 0) \approx 1$). This represents strong evidence for an effect of the interaction of DISCOURSE TOPIC and PRONOUN. The factor DISCOURSE TOPIC affected REF2 preferences in distinct directions for the two types of pronouns. Accordingly, the factor DISCOURSE TOPIC did not show reliable support for an effect independent of pronoun type (95% CrI: [-0.723, 1.34], $P(\beta > 0) = 0.73$).

In addition, both a model for ER and a model for DIESER showed a reliable effect for DISCOURSE TOPIC (the 95% credible intervals were [-1.05, -0.65] and [0.60, 1.24], respectively, also both showed a posterior probability of $P(\beta > 0) \approx 1$).

4.3 Discussion

In light of a differentiated effect of discourse topic in the previous two experiments, we asked whether knowledge of a famous protagonist had brought about the results in Experiments 1 and 2. We conjectured that the embedding in a well-known story theme like *Sherlock Holmes* interfered with the current discourse topic, with the effect of disabling or weakening the influence of the discourse topic. Experiment 3 thus removed any overt pointers to the novels and set the scene for random story presentations. The results from the referent selection task indicate a compelling impact of discourse topicality. Both pronominal forms were affected by discourse topicality: When sentence and discourse topic converged, the demonstrative pronoun registered a clear anti-topic bias (93% choices for REF2); when sentence topic (REF1) and discourse topic (REF2) were in competition with each other, REF2 preferences dropped to 79% for the demonstrative pronoun. Similarly, the personal pronoun showed a somewhat weaker preference for REF1 in the alignment case (77% REF1, 23% REF2) and a decrease of this preference when sentence topic (REF1) and discourse topic (REF2) were not aligned (46% REF1, 54% REF2). These findings suggest that discourse topicality qualifies as a prominence-lending cue and competes with the local sentence topic during reference processing. The data therefore confirm the hypothesis of an influence of discourse topicality. In comparison with Experiments 1 and 2, the data further indicate that the fictional world represented by the protagonist layer interferes with discourse topicality in intricate ways. We return to this in Section 5.

5. General discussion

Previous approaches to pronoun resolution have focused on various (interacting) features of the antecedent as prominence-lending cues of pronoun resolution. Demonstrative pronouns have been claimed to avoid the most prominent entity. The vast majority of this research has only targeted local cues, such as sentence topicality, grammatical function, thematic role or order of mention in the sentence immediately preceding the pronoun or in the matrix clause if the pronoun occurs in the subordinate clause. Here we explored the contribution of the discourse topic, which characterizes prominence on a more global, discourse-structural level. The data from Experiment 3 indicate that sentence and discourse topicality interact with each other in such a way that when they do not converge on the same referent, preferences arising from local cues are reduced. This effect occurs for the demonstrative pronoun in all three experiments. Experiments 1 and 2 further suggest that discourse topicality may be suspended in the presence of another layer, such as reference to a famous novel with its protagonist(s) (what we refer to as the protagonist layer). Intriguingly, the interplay of the discourse layer and the protagonist layer mainly affects the interpretive biases of the personal pronoun.

Overall, the data indicate first that sentence and discourse topicality serve as prominence-lending cues during reference resolution. When they are not aligned, they compete with each other in such a way that the global cue weakens interpretive biases for the local cue. Second, discourse-structural cues are organized in layers (here, the discourse layer vs. the protagonist layer), and conflicting questions under discussion from these layers can disable each other. This ultimately paves the way for the local cue to dominate prominence computation in the presence of a protagonist layer. And third, the demonstrative pronoun *dieser* is sensitive to local and global prominence-lending cues within the discourse layer, but ignores cues from the protagonist layer. These findings imply that discourse-level cues must be taken into consideration for a model of prominence. In the following, we first discuss the notion of the protagonist layer before elaborating on the implications of the findings for prominence computation and demonstrative pronoun resolution.

5.1 The protagonist layer: Discourse organization beyond the discourse topic

A discourse topic indicates what a text or text segment is about and thus represents a core constituent for the organization of the discourse structure (van Dijk, 1977; van Kuppevelt, 1995). A discourse can be described as an ordered set of (explicit or implicit) questions, some of which constitute (sentence) topics proper (forming the core discourse structure) and others subtopics (providing additional information to a topic question that has not been answered in a satisfactory way yet) (Klein & von Stutterheim, 1987; van Kuppevelt, 1995). The discourse topic is considered the sum of all topics in a text (segment), and a topic hierarchy has been proposed

such that discourse topics dominate sentence topics, which dominate subtopics. In the stimuli of the present study, the discourse topic referred to one of the two characters mentioned at the outset and repeatedly in the story, e.g., *the villain* in (3) and *Holmes* in (4), answering the question “What happened to the villain?” or “What happened to Holmes?”, respectively.

While the instantiation of the discourse topic has been kept stable across the experiments, an additional effect emerged between experiments linked to world knowledge. This effect was triggered by the introduction of a famous protagonist or well-known theme, which we propose results in the introduction of a protagonist layer. The presence of the protagonist layer inhibited the influence of the discourse topic on reference resolution – at least in the case of the personal pronoun.

Table 1 provides an overview of the experimental manipulations across the three experiments. On the one hand, the experiments differed with respect to the presentation modality, i.e., presentation of items from a story theme in a block vs. in randomized order, and with or without an introductory passage, respectively. On the other hand, the experiments made use of world knowledge by using proper names of famous protagonists from well-known pieces of literature. A pronounced difference emerged between Experiments 1 and 2 on the one hand and Experiment 3 on the other, and this difference can be attributed to the presence of the protagonist layer.

Table 1: Experimental manipulations across the three experiments.

	Experiment 1	Experiment 2	Experiment 3
Presentation modality: Block design & introduction of fictional world	✓ (block)	✗ (randomized)	✗ (randomized)
World knowledge: Famous protagonists	✓	✓	✗

We argue that in the presence of the protagonist layer, the discourse topic became less important and lost its force as a prominence-leading cue, conferring the decisive influence to the local sentence topic. This became evident in the case of the personal pronouns with a lack of a discourse topicality effect in Experiments 1 and 2. In the absence of the protagonist layer in Experiment 3, the misalignment of sentence topic and discourse topic resulted in less pronounced interpretive preferences for both types of pronouns (i.e., lower preferences for REF2 for the demonstrative and more selections of REF2 for the personal pronoun). The results of Experiments 1 and 2 indicate that mention of a proper name alone suffices to activate the fictional world and create a protagonist layer.

One could ask why we posit different layers, rather than simply expanding the set of prominence-lending cues that are involved in reference resolution to include a protagonist cue. First, the layers are empirically motivated, because the notion of layers better captures the data from our three experiments. While prominence-lending cues such as subjecthood or first-mention can act jointly to boost prominence when they converge on the same referent or weaken prominence when they diverge, the picture that emerges from the comparison of Experiments 1 and 2 with Experiment 3 is quite different. Here, the activation of protagonist information does not affect reference resolution directly by increasing the prominence of those entities in the discourse. Rather, the activation of protagonist information makes a certain set of cues (in this case, discourse topic) less relevant, which then in turn makes the local cues (in this case, sentence topic) more decisive. This is quite unlike the kind of interplay that is normally seen between prominence-lending cues, such as grammatical or thematic role, and is better captured by the notion of layers, such as a protagonist layer and associated QUDs. Second, the notion of layers is theoretically motivated, considering existing proposals for perspective-taking, where perspectival center and narrator are associated with different layers of the discourse (Altshuler & Maier, 2020; Bimpikou, 2020; Hinterwimmer, 2019). It also aligns with, and expands, the account of perspectival centers and demonstrative pronoun resolution that is presented in Patil et al. (2023).

Our findings therefore indicate that a characterization of global discourse-structuring features must incorporate different layers, including the discourse layer with its discourse topic as well as possibly supplementary layers, such as the protagonist layer or the perspective holder's layer.

5.2 Prominence computation: Interaction of local and global cues

With respect to the role of prominence-lending cues from the local and global domain, Experiment 3 implies that sentence and discourse topicality interact with one another. Specifically, the preference for interpreting the demonstrative pronoun *dieser* with respect to the less prominent entity of the previous sentence (i.e., the non-sentence-topic) decreased in Experiment 3 if that referent was the discourse topic. In that case, the sentence topic emerges as a potential candidate for the resolution of *dieser*, suggesting that it is less prominent in the overall discourse. The fact that interpretive preferences are merely lowered, and not shifted altogether, suggests that the misalignment of sentence and discourse topicality creates interpretive uncertainty. Similar effects were observed for the generally more flexible personal pronoun, i.e., interpretive biases were stronger in the case of alignment. This indicates that when we move away from contexts consisting of just one sentence to larger discourses, we need to take into account both local and global discourse-structuring cues. In addition to discourse topics, coherence relations will play an important role (see, e.g., Elman et al., 2006; Kehler & Rohde, 2013) as well as text-type specific constraints. Whether the observed discourse topicality effects are specific to the relation of narration, which we also employed here (see Asher, 2004), remains subject to future research. Note further that the two types of pronouns showed different sensitivities to our manipulation;

this resonates with investigations of other prominence-lending cues that report form-specific mechanisms (e.g., Kaiser, 2011; Kaiser & Trueswell, 2004, 2008).

The data from Experiments 1 and 2 suggest that the availability of a protagonist layer with its overarching question under discussion (“What’s happening with Sherlock Holmes?”) weakens any potential discourse topic to the extent that this cue is not considered for prominence computation. We thus propose that QUDs from different layers are capable of disabling each other, making the local cues more decisive. We do not want to argue that the protagonist becomes available as a prominence-lending cue. Instead, the interplay of the two layers creates a conflict with regard to the goals of the discourse (answering the QUDs) and although these might be very similar (e.g., “What’s happening with Holmes?”), their availability encumbers the use of global cues in favor of more local cues. In the absence of the protagonist layer (Experiment 3), sentence and discourse topicality contribute to the prominence ranking, yielding clear interpretative biases when the two cues converge on the same referent (topic preference of personal pronoun and topic avoidance of the demonstrative pronoun). In contrast, when the two cues are not aligned, a competition emerges, rendering overall weaker referential preferences with respect to the local cue. In the presence of the protagonist layer, the discourse topic cannot exert its impact.

The data contribute to research on the interaction of prominence-lending cues. Previous work indicates that multiple sentence-level cues compete with each other during the dynamic computation of referential prominence, and that the sentence topic holds a pivotal role. Schumacher et al. (2016, 2017), for instance, show that interpretive preferences are most pronounced when feature alignment involves the initial position (i.e., the sentence topic). In Experiment 3, we also observe that the alignment of sentence and discourse topic yields more pronounced selectional choices.

5.3 Demonstrative pronouns

The three experiments also provide new insights into the processing of the *dieser*-demonstrative, since the majority of previous research has targeted the demonstrative pronoun *der*. The data for *dieser* indicate that resolution relies on subtle interactions of prominence cues involving sentence and discourse topicality. In all three experiments, the misalignment of sentence topic (REF1) and discourse topic (REF2) resulted in a decrease of REF2 interpretations for *dieser*.

These consistent patterns of *dieser* across the three experiments further indicate that *dieser* is not amenable to the information provided by the protagonist layer. The data from Experiments 1 and 2 point towards an interesting difference between personal and demonstrative pronouns, because *dieser* exhibits a sensitivity to the discourse topic manipulation that the personal pronoun does not show. We take this as an indication that *dieser* – in contrast to the personal pronoun – is not sensitive to the protagonist layer during reference resolution. Such argumentation is

in line with previous findings that the demonstrative pronoun *dieser* is immune to perspectival cues, while the demonstrative pronoun *der* considers the perspectival anchor for prominence computation (Patil et al., 2023). Crucially, in this latter study, a unified prominence-based account is proposed for the two types of demonstrative pronouns. Accordingly, perspectival centers are ranked higher than sentence topics on the prominence scale, but only the demonstrative pronoun *der* considers the perspectival center as a potential referent (and ultimately rejects it, because *der* avoids the most prominent entity), while for *dieser*, the sentence topic is the highest ranked referential candidate (yielding rejections of the most prominent sentence topic). In order to coalesce the current findings with those involving perspectival centers, we propose that during referential resolution, *dieser* is confined to the discourse layer. Accordingly, it can only consider the prominence-lending cues made available by the discourse layer, yielding the discourse topic as a maximally prominent entity in Experiments 1–3, or in Patil et al. (2023), the sentence topic but crucially not the perspectival center or protagonist knowledge, which reside in different layers.

An anonymous reviewer pointed out that in our experimental stimuli, the discourse topic is also the perspectival center, whose inner thoughts are expressed. This makes it potentially difficult to determine which cue is ultimately decisive during pronoun resolution. Our unified account of separate layers offers a solution to this: we claim that *dieser* is insensitive to the perspective layer (Patil et al., 2023) as well as to the protagonist layer (Exp.1 and 2). If this claim is correct, then the similar interpretive preferences for *dieser* in all three experiments should be attributed to the discourse topic, i.e., the misalignment of discourse and sentence topic weakens interpretive preferences.

6. Conclusion

In sum, the findings demonstrate that discourse topicality competes with local factors of the immediately preceding sentence, unless the wider discourse (genre-specific knowledge triggering a protagonist layer) interferes with these structural constraints. This indicates that discourse topicality qualifies as a prominence-lending cue and that both personal and demonstrative pronoun resolution is affected by the interplay of sentence and discourse topicality. The investigation further suggests that discourse representation makes available distinct structural layers, including the discourse layer with the discourse topic (of a text segment) as well as the protagonist layer (encoding an additional set of questions under discussion). While the discourse topic serves as a prominence-lending cue, the presence of a protagonist layer can suspend the influence of the discourse topic.

Data accessibility statement

Analysis scripts, data tables and materials for all experiments are stored on the Open Science Framework website and are publicly available for educational, research and non-profit purposes under appropriate attribution (CC-By Attribution 4.0 International License): <https://osf.io/hgbc3/>.

Ethics and consent

The studies involving human participants were reviewed and approved by the Ethics Board of the Deutsche Gesellschaft für Sprachwissenschaft (DGfS, German Linguistic Society). The participants provided their written informed consent to participate in this study.

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Competing interests

The authors have no competing interests to declare.

Author contributions

First author: conceptualization, writing – original draft, writing – review & editing, funding acquisition, project administration, resources, supervision; second author: conceptualization, data curation, formal analysis, investigation, writing – review & editing, project administration; third author: data curation, writing – original draft, writing – review & editing, formal analysis, investigation, visualization.

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