Puzzling response particles: An experimental study on the German answering system*

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Abstract This paper addresses the use and interpretation of the German response particles *ja, nein* and *doch*. It presents a series of four experiments that collected acceptability-judgment data for the full paradigm of standard German particles in responses to positive and negative assertions and were designed to test the empirical validity of two recent accounts of response particles, Roelofsen & Farkas (2015) and Krifka (2013), which view response particles as propositional anaphors, and which we refer to as feature model and saliency account, respectively. The results for responses to negative antecedents were unpredicted and inconsistent with either account. A further unexpected finding was that there was large interindividual variation in the acceptability patterns for affirming responses to negative antecedents to the extent that some speakers found *ja* more acceptable whereas other found *nein* more acceptable. We discuss possible revisions of the feature model and the saliency account to account for the findings, and explore in how far the findings can be accounted for in alternative, ellipsis accounts of response particles.

Keywords: response particles, polarity, negation, propositional anaphors, ellipsis

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Word count: 17329
1 Introduction

Response particles such as English yes and no are a short and frequent means of answering polar questions and of expressing affirmation or rejection of assertions. Yet response particles are puzzling. English yes and no responses are unambiguous with positive antecedents¹, for example, assertions as in (1). A yes response affirms and a no response rejects a positive antecedent.

(1) A: Bill smokes.
   B: i. Yes, he does.     ii. #Yes, he doesn’t.
      iii. #No, he does.   iv. No, he doesn’t.

However, for negative² antecedents, such as the assertion in (2), yes and no are not complementary. Both response particles can be used in affirming as well as rejecting responses to a negative antecedent (Kramer & Rawlins 2011: negative neutralization).

(2) A: Bill doesn’t smoke.
   B: i. Yes, he DOES.    ii. Yes, he doesn’t.
      iii. No, he DOES.   iv. No, he doesn’t.

The present article investigates the meaning and use of response particles in German, which in addition to translation equivalents of yes and no (ja and nein) has a specialized particle (doch) for rejecting responses to negative antecedents, that is, for discourses like (2) A-B.i/iii. The paper addresses the question as to the acceptability of the three German answer particles in discourses like (1) and (2) by experimental investigation, and discusses the theoretical implications of the findings.

Pope (1976) proposed that cross-linguistically a distinction can be made between two major answering systems, so-called polarity-based systems and truth-based systems (also cf. Jones, 1999; ¹We are using the term antecedent in this paper in the meaning of antecedent to an anaphoric expression. The antecedent is a proposition that is introduced by the statement or question that the response particle responds to. Furthermore, note that we are only discussing standard response particles like yes and no in this paper, and not responses like yeah, yup, uh-huh, or right. ²Throughout this paper, we are using the term negative in the restricted sense of propositional negation.)
In polarity-based systems, the choice of response particles is determined by the polarity of the response clause. That is, a response particle signals either the positive or the negative polarity of the response clause. In truth-based systems, the decisive dimension is the validity of the antecedent. A response particle signals either the truth or the falsity of the antecedent. This distinction is intuitively appealing and continues to form the basis for current cross-linguistic investigations of response particles (e.g. Holmberg 2015). However, it is not able to explain the full range of data patterns so that different accounts are called for. Recent accounts fall into two major types: ellipsis approaches and anaphor approaches. Proponents of the ellipsis approaches view response particles as elliptical constructions where a full response clause is elided under syntactic identity with an antecedent (the preceding assertion or question), and the response particle is the remnant in the ellipsis clause (Kramer & Rawlins 2011, Holmberg 2013, 2015). Proponents of the anaphor approaches argue that response particles are propositional anaphors (Krifka 2013, Roelofsen & Farkas 2015). The anaphor approaches explicitly address the German response system, which is the topic of the present investigation. We will introduce them in detail in the next section. In the discussion at the end of the paper we will also review the ellipsis approaches, propose likely adaptations to the German system, and explore how the experimental findings to be reported below might be accounted for in these frameworks.

The paper is structured as follows. After a detailed description of the German response particle system and the explication of the anaphor approaches proposed by Roelofsen & Farkas (2015) and by Krifka (2013) in Section 2, Section 3 reports four experiments that were designed to evaluate the empirical validity of the two approaches and to provide the first systematic investigation of preference patterns for German response particles. Section 4 discusses the experimental findings with respect to the two anaphor accounts and explores possible alterations to the existing accounts. Section 5 discusses the experimental findings with respect to the ellipsis accounts. Section 6 concludes the paper.

2 German response particles: ja, nein, and doch

As was already mentioned above, the German response particle system differs from the English one in that it is a system with three particles. Besides ja and nein, it includes the particle doch. The particles
ja and nein roughly correspond to English yes and no, respectively. With positive antecedents, as in (3), the use and interpretation of ja and nein is clear-cut. A response with ja affirms a positive antecedent and a response with nein rejects it. For negative antecedents, as in (4), ja and nein are not complementary. Both can be used to affirm a negative antecedent (see e.g., Blühdorn 2012: 386).

Doch is a specialized particle which is typically used for rejecting responses to negative antecedents.³

(3) A: Bill raucht. (‘Bill smokes.’)
   B: i. Ja. (= He does.)
      ii. Nein. (= He doesn’t.)
      iii. #Doch.

(4) A: Bill raucht nicht. (‘Bill doesn’t smoke.’)
   B: i. Ja. (= He doesn’t.)
      ii. Nein. (= He doesn’t.)
      iii. Doch. (= He does.)

Note that the pattern in (4) appears to be restricted to antecedents with widest-scope negation. For antecedents with narrow scope negation (e.g., At most four of Bill’s friends don’t smoke. / On some days, Bill doesn’t smoke) the use of response particles corresponds to their use for antecedents without negation⁴ (as in (3)), that is, ja and nein are complementary and doch is not licit.

Roelofsen & Farkas (2015) and Krifka (2013) analyze the German response particles as anaphoric expressions which require the presence of a salient proposition in the discourse context. The approaches differ with respect to the role this salient proposition plays in the anaphoric process and with respect to the role of salience itself. For reasons that will become clear instantly, we will use the

³ The refusal of an explicit negative antecedent constitutes the standard use of the response particle doch. The particle can also be used as a response to positive antecedents (Helbig 1988), if a corresponding negative proposition can be accommodated. However, this use of doch is marginal; it seems to be restricted to special contexts. For an elaborate analysis of doch as a response particle see Karagjosova (2006).

⁴ Findings reported in Brasoveanou et al. (2013) suggest that the analogous holds for English yes and no. For antecedents with a narrow scope reading of the negation (e.g. At most six volunteers did not sign up for free housing / Exactly two of the chimps did not make any mistakes in carrying out the final task), yes was found to be preferred over no in affirming responses. This pattern is the reverse of the pattern that was found for antecedents with sentential negation (e.g. The government representatives didn’t go to the Congo) and corresponds to the use of yes and no in responses to positive antecedents.
term **feature model** to refer to the model proposed by Roelofsen & Farkas (2015) and the term **saliency account** to refer to Krifka’s (2013) model.

### 2.1 The feature model and its assumptions for German: Roelofsen & Farkas (2015)

The syntactic-semantic feature model proposed by Roelofsen and Farkas (2015) is framed in terms of inquisitive semantics, which provides a fine-grained framework to distinguish different types of polar antecedents. The model draws on Farkas & Bruce’s (2010) commitment based discourse model and builds on the distinction between polarity-based and truth-based answering systems. It is intended as a universal account of response particles. Concretely, Roelofsen and Farkas assume that the choice of response particles cross-linguistically depends on two types of features, with one type (absolute polarity features) encoding whether the response clause has positive or negative polarity and the other type (relative polarity features) encoding whether the response clause agrees with or reverses the antecedent with regard to content and polarity.

The features are hosted by the head of a polarity phrase (see (5)). The polarity phrase takes a clausal argument, the *prejacent*, which may be partially or fully elided (in bare-particle responses). The features impose presuppositions on the prejacent with regard to feature-specific semantic values. If the prejacent satisfies the presupposition of a given feature, the corresponding semantic value is passed to the polarity phrase node and morphological insertion rules insert the polarity particle that realizes the given features. The absolute polarity features ([+] and [−]) impose a presupposition on the polarity of the prejacent: “[+] and [−] presuppose that their prejacent expresses a proposition containing a single possibility”, which is highlighted and has positive or negative polarity, respectively” (Roelofsen & Farkas 2015: 385). The term **highlighted** is adopted from Roelofsen & van Gool (2010). A highlighted possibility is one that is particularly salient and therefore may become available for subsequent anaphoric reference. The relative polarity features ([AGREE] and [REVERSE]) pose a presupposition on the semantic relation between the prejacent and the antecedent: [AGREE] and

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5 The term *possibility* comes from inquisitive semantics, where sentences suggest possible updates of the common ground. A sentence expresses a proposition, which is a set of possibilities. A possibility is a set of indices and represents a possible update of the common ground. Simple declaratives express single possibilities, polar questions express two possibilities.

6 For instance, the polar question *Is John coming?* expresses the two possibilities {*John is coming, John is not coming*} and highlights the positive possibility *John is coming*.  

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(5)
[REVERSE] “presuppose that their prejacent highlights a unique possibility \( \alpha \), and that the discourse context contains a unique most salient antecedent possibility \( \beta \) such that \( \alpha \) agrees with/reverses \( \beta \), both in terms of content and in terms of polarity” (Roelofsen & Farkas 2015: 385).

(5)

The feature-realization potentials, that is, the licit connections between features and response particles, are assumed to be language-specific. For German, Roelofsen & Farkas propose the realization potential in (6).

(6) **Feature realization potential of ja, nein, and doch**

\( ja \) can realize [+ or [AGREE]

\( nein \) can realize [- or [REVERSE]

\( doch \) realizes [REVERSE, +]

Given four possible feature combinations, (6) results in (7).

(7) **Feature combinations and particles in German**

[AGREE, +] can only be realized by \( ja \)

[REVERSE, -] can only be realized by \( nein \)

[AGREE, -] can be realized by \( ja \) or \( nein \)

[REVERSE, +] can only be realized by \( doch \)

The proposal in (7) explains why the use of \( ja \) and \( nein \) is complementary in responses to positive antecedents ([AGREE, +] and [REVERSE, -]) and why both \( ja \) and \( nein \) can be used in affirming responses to negative antecedents ([AGREE, -]). However, the feature model implies a difference in
preference between *ja* and *nein* on the basis of markedness considerations. Roelofsen & Farkas propose that the absolute feature [–] is more marked than the absolute feature [+], on the assumption that expressions with negative polarity are more marked than expressions with positive polarity. For the relative features, they assume that [REVERSE] is more marked than [AGREE] because the complement relation is more complex than the identity relation. Furthermore, Roelofsen & Farkas assume that more marked features have a higher realization need than less marked features. From these markedness considerations, predictions for preference patterns of the response particles can be derived.\(^7\) For affirming responses to negative antecedents [AGREE, –], the feature model predicts a preference for *nein* over *ja* because *nein* realizes the marked feature [–] whereas *ja* realizes the unmarked feature [AGREE]. For rejecting responses to negative antecedents ([REVERSE, +]), an additional factor comes into play. Roelofsen & Farkas assume that the particle *doch* is the dedicated particle for this feature combination, and therefore blocks *nein* and *ja*, that is, the feature combination [REVERSE, +] can only be realized by *doch*. Both markedness and the blocking mechanism are crucial in the feature model to account for the preference patterns for German response particles but note that the model in general allows for the influence of other, additional factors, e.g. the pressure to avoid ambiguity (cf. Roelofsen & Farkas 2015).

2.2 The saliency account and its assumptions for German: Krifka (2013)

Krifka’s (2013) saliency account is an optimality theoretic approach to the interpretation of response particles. The saliency account comes with four main assumptions: 1. Response particles are propositional anaphors that pick up a propositional discourse referent (henceforth propDR), introduced by the antecedent. 2. Negative antecedents introduce two propDRs, anchored to a proposition and its negation. 3. These two propDRs differ in saliency. 4. The relative saliency of these propDRs is context-dependent.

More specifically, Krifka analyzes *ja* as asserting the propDR it picks up whereas *nein* asserts the negation of the targeted propDR. This holds for positive as well as for negative antecedents. As

\(^7\) Another effect of the markedness considerations is the generation of typological predictions. Since the present study only focuses on German, only the predictions for this answer system are discussed. See Roelofsen & Farkas (2015) for typological predictions of the model.
already mentioned, the latter are assumed to introduce two propDRs, as illustrated in (8).

(8)  \[ [\text{Bill} [\neg \text{Bill doesn't [pDR tBill smoke]]}] = \neg(\text{smoke(Bill)}) \]

\[ \neg \text{pDR}, \text{i.e., negative propDR: } \neg(\text{smoke(Bill)}) \]

\[ \text{pDR}, \text{i.e., positive propDR: smoke(Bill)} \]

The negative propDR, henceforth \( \neg \text{pDR} \), is the negated proposition established by the antecedent. The positive propDR, henceforth \( \text{pDR} \), is the positive proposition in the scope of the negation operator. \( \neg \text{pDR} \) and \( \text{pDR} \) can both be picked up by anaphora (cf. … Mary knows that (\( \neg \text{pDR} \)) vs. Mary would have known that (pDR)), including the propositional anaphora ja, nein, and doch. The particle doch comes with the presupposition that both \( \neg \text{pDR} \) and \( \text{pDR} \) are salient and that doch picks up \( \text{pDR} \) and asserts it, thereby blocking ja in picking up \( \text{pDR} \) in the context of a salient negative antecedent. This proposal, which is summarized in Table 1, results in a complementary use of ja and nein with positive antecedents and a non-complementary use in affirming responses to negative antecedents, with ja picking up and asserting \( \neg \text{pDR} \), and nein picking up \( \text{pDR} \) and asserting its negation.

<table>
<thead>
<tr>
<th>Positive antecedents</th>
<th>Particle</th>
<th>Targeted propDR</th>
<th>Meaning</th>
<th>Response type</th>
</tr>
</thead>
<tbody>
<tr>
<td>(e.g., Bill smokes)</td>
<td>ja</td>
<td>( \text{pDR} )</td>
<td>( \text{pDR} ) e.g., smoke(Bill)</td>
<td>affirmation</td>
</tr>
<tr>
<td></td>
<td>nein</td>
<td>( \text{pDR} )</td>
<td>( \neg \text{pDR} ) e.g., ( \neg (\text{smoke(Bill)}) )</td>
<td>rejection</td>
</tr>
<tr>
<td>Negative antecedents</td>
<td>ja</td>
<td>( \neg \text{pDR} )</td>
<td>( \neg \text{pDR} ) e.g., ( \neg (\text{smoke(Bill)}) )</td>
<td>affirmation</td>
</tr>
<tr>
<td>(e.g., Bill doesn’t smoke)</td>
<td>nein</td>
<td>( \neg \text{pDR} )</td>
<td>( \text{pDR} ) e.g., smoke(Bill)</td>
<td>rejection</td>
</tr>
<tr>
<td></td>
<td>doch</td>
<td>( \text{pDR} )</td>
<td>( \text{pDR} ) e.g., smoke(Bill)</td>
<td>rejection</td>
</tr>
</tbody>
</table>

Table 1 Targeted propDR and meaning of ja, nein, and doch with positive and negative antecedents.

Regarding the relative saliency of \( \neg \text{pDR} \) and \( \text{pDR} \), Krifka proposes that \( \text{pDR} \) (e.g., smoke(Bill)) is by default more salient than \( \neg \text{pDR} \) (e.g., \( \neg (\text{smoke(Bill)}) \)) based on the reasoning that negative antecedents are usually uttered in contexts in which the non-negated proposition is salient already. He further
assumes that the relative saliencies are reversed in negative contexts, such as a negative question preceding the antecedent, see (9) further below. Since more salient referents are more accessible they are more readily picked up by anaphors than less salient referents (e.g., Ariel 1990, Gundel, Hedberg, & Zacharski 1993). Therefore, the proposed relative saliencies are assumed to affect the preference patterns for ja and nein.

To illustrate the predictions derivable from the saliency account, let us first consider the case of affirming responses to negative antecedents, e.g., Bill doesn’t smoke. In this case, nein picks up $p_{DR}$ (e.g., $\neg(smoke(Bill))$) and asserts its negation, whereas ja picks up $\bar{p}_{DR}$ (e.g., $\neg(smoke(Bill))$) and asserts it. The preference for either of the two response particles should depend on the relative saliencies of $\bar{p}_{DR}$ and $p_{DR}$, which in turn should depend on the context. In neutral contexts (the default), $p_{DR}$ is assumed to be more salient than $\bar{p}_{DR}$, resulting in a preference for nein which picks up $p_{DR}$. This pattern should be reversed in negative contexts, as in (9), where a negative question precedes the antecedent: $\bar{p}_{DR}$ is assumed to be more salient than $p_{DR}$, resulting in a preference for ja which picks up $\bar{p}_{DR}$.

(9)  
A: Wer von deinen Freunden raucht nicht?  
who of your friends smokes not  
‘Which of your friends doesn’t smoke?’  
B: Bill raucht nicht.  
Bill smokes not  
‘Bill doesn’t smoke.’  
C: Ja/Nein/Doch.

In the case of rejecting responses to negative antecedents, nein picks up $\bar{p}_{DR}$ (e.g., $\neg(smoke(Bill))$) and asserts its negation, doch picks up $p_{DR}$ (e.g., $smoke(Bill)$), and asserts it, and ja (but not nein) is blocked by doch in picking up $p_{DR}$. In neutral contexts, doch, which picks up the more salient $p_{DR}$ should be preferred over nein. The reverse is predicted for negative contexts. Here nein, which picks up the more salient $\bar{p}_{DR}$, should be preferred over doch. As for ja, there should be a strong and general, i.e., context-independent, dispreference.
Krifka casts this analysis in an optimality theoretic framework. The relevant constraints are given in (10).

(10) a. *NONSAL: Penalizes picking up a less salient discourse referent
    b. PRES: Penalizes the violation of presuppositions
    c. *BLOCK: Meta-constraint; penalizes using non-optimal form/meaning pairs

*NONSAL is a constraint that is relevant for anaphora in general. It ensures that there is a preference for picking up the most salient antecedent. PRES is a constraint that penalizes the violation of presuppositions. Since the lexical entry of *doch* comprises the presupposition that the particle picks up \( p_{DR} \) when both \( \bar{p}_{DR} \) and \( p_{DR} \) are present, the constraint penalizes picking up \( \bar{p}_{DR} \) by *doch*. *BLOCK is a meta-constraint by which optimal form-meaning pairs suppress the expression of the same meaning by a different form, or the use of the same form to express a different meaning (cf. Beaver 2004 on the effect of *BLOCK on the use of stressed pronouns in English). In the case at hand, *BLOCK has the effect that the optimal form-meaning pair *doch*/\( p_{DR} \) suppresses the use of *ja*, which also picks up \( p_{DR} \) to express the same meaning, \( p_{DR} \). The blocking of *ja* in this case is a special case of the pragmatic rule, “Maximize Presupposition” (cf. Heim 1991): notice that *doch* carries a presupposition that *ja* doesn’t.

The following OT tableau with the ranking *BLOCK > PRES > *NONSAL shows the resulting evaluations both in the default case when \( p_{DR} \) is assumed to be more salient, and the special case when \( \bar{p}_{DR} \) is more salient. With a salient \( p_{DR} \), the optimal response particle is *nein* for affirming responses and *doch* for rejecting responses. With a salient \( \bar{p}_{DR} \), *ja* is the optimal particle for affirming responses and *nein* for rejecting responses.
### Table 2

OT tableau for *ja*, *nein*, and *doch* with negative antecedents. For rows in the same color the meaning expressed by the particle is the same (*pDR* for rejecting responses; *p̅DR* for affirming responses).\(^8\)

<table>
<thead>
<tr>
<th>Particle</th>
<th>Targeted propDR</th>
<th>Meaning</th>
<th>*BLOCK</th>
<th>PRES</th>
<th>*NONSAL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Salient propDR = pDR</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>ja</em></td>
<td>pDR</td>
<td>pDR = rejecting</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>p̅DR</td>
<td>p̅DR = affirming</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>nein</em></td>
<td>pDR</td>
<td>¬pDR = affirming</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>p̅DR</td>
<td>¬pDR = rejecting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>doch</em></td>
<td>pDR</td>
<td>pDR = rejecting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>p̅DR</td>
<td>p̅DR = affirming</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Salient propDR = p̅DR</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>ja</em></td>
<td>pDR</td>
<td>pDR = rejecting</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>p̅DR</td>
<td>p̅DR = affirming</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>nein</em></td>
<td>pDR</td>
<td>¬pDR = affirming</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>p̅DR</td>
<td>¬pDR = rejecting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>doch</em></td>
<td>pDR</td>
<td>pDR = rejecting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>p̅DR</td>
<td>p̅DR = affirming</td>
<td>*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 2.3 Summary of the predictions of the feature model and saliency account

Let us sum up and compare the predictions of the two approaches. The feature model proposed by Roelofsen & Farkas (2015) does not predict any context effects. For affirming responses to negative antecedents, a general preference for *nein* over *ja* is predicted. For rejecting responses, there should be a strong preference for *doch*; both *ja* and *nein* should be strongly dispreferred and not differ in preference. The saliency account proposed by Krifka (2013) makes the prediction that the preferences for response particles should be sensitive to the wider discourse context. For affirming responses, a preference for *nein* over *ja* is predicted in default contexts, whereas in negative contexts, there should

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\(^8\) In the OT tableaux and some of the other tables we use grey shading for rejections to facilitate orientation.
be a preference for *ja over nein. For rejecting responses in default contexts, there should be a preference for *doch over nein, while for negative contexts a preference for *nein over *doch is predicted. In both contexts, *ja is predicted to be strongly dispreferred as a rejecting response due to the highly ranked *BLOCK constraint. The preference difference between *nein and *ja should be larger in negative contexts than in default contexts because in the former the proposition that *nein picks up, \( \overline{\text{p}}_{\text{DR}} \), is the most salient proposition whereas in the latter it is not. Table 3 juxtaposes the predictions of the feature model and the saliency account for responses to negative antecedents.

<table>
<thead>
<tr>
<th>Response type</th>
<th>Context</th>
<th>Predicted preference patterns</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Saliency account</td>
<td>Feature model</td>
</tr>
<tr>
<td>Rejecting</td>
<td>Positive (default)</td>
<td>*doch &gt; *nein &gt; *ja</td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td>*nein &gt; *doch &gt; *ja</td>
</tr>
<tr>
<td>Affirming</td>
<td>Positive (default)</td>
<td>*nein &gt; *ja</td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td>*ja &gt; *nein</td>
</tr>
</tbody>
</table>

Table 3  Comparison of the predictions of the saliency account vs the feature model for negative antecedents.

3  Experiments

The present study served two main goals. One goal was to experimentally compare the feature model and the saliency account. For this purpose, we focused on the collection of experimental data for responses to negative antecedents and explored the fact that the two approaches differ with regard to whether or not they assume effects of the discourse context. The second goal was to gain more general insights with regard to preference patterns of German response particles. To this end, we obtained data for the full paradigm of standard response particles in German for negative as well as for positive antecedents. We narrowed the study to assertions as antecedents, thereby avoiding the issue of negation ambiguity in polar questions (cf. Ladd 1981). As an indicator for the preference patterns that were predicted by the theories, we used acceptability judgements under the assumption that acceptability ratings reflect strength of preference.
We conducted four experiments. Participants were presented with short dialogues, consisting in an assertion (e.g., *The vet hasn’t vaccinated the cats yet.*) and a response to it. Each dialogue was preceded by a short scene-setting passage, which specified the dialogue’s context. The participants’ task was to judge the naturalness and suitability of the response in the given dialogue and context on a 7-point rating scale.

The four experiments differed in their foci of investigation. Experiment 1 examined full-clause responses to positive assertions. Experiment 2 investigated the acceptability of *ja* and *nein* in affirming and rejecting full-clause responses to negative assertions. Experiment 3 focused on rejecting full-clause responses to negative assertions and included *doch*. The focus of Experiment 4 was affirming responses to negative assertions with bare particles. In all four experiments, we manipulated the dialogue’s context. In Experiments 1 to 3, the context was either positive, that is, assumed to be associated with a salient p_{DR} (e.g., *They are talking about which animals the vet has vaccinated already.*) or negative, i.e., assumed to be associated with a salient p̄_{DR} (e.g., *They are talking about which animals the vet hasn’t vaccinated yet.*). In Experiment 4, the positive context was replaced by a neutral context (e.g., *They are talking about the vet and the vaccination procedure*).

### 3.1 Experiment 1: Responses to positive assertions

Experiment 1 collected acceptability judgements for *ja* and *nein* in responses to positive assertions. Here, the predictions of the feature model and the saliency account are uncontroversial. With affirming responses, there should be a strong preference for *ja*, which should be reflected in higher acceptability ratings for *ja* compared with *nein*. This pattern is predicted to be reversed with rejecting responses. Both patterns should not be modulated by the experimental manipulation of the discourse context.

#### 3.1.1 Method

**Participants** Forty-eight students (19 to 38 years, \(M = 25.31\); 36 female) from Humboldt-Universität zu Berlin participated in the experiment. All were native speakers of German. They gave informed consent for participation and received a monetary reimbursement for their participation. One additional participant was replaced because she/he was not a native speaker of German, and one other
additional participant was replaced because her/his performance on the verification statements for the experimental items was not significantly better than chance.

**Materials** There were 48 experimental items, 16 filler items, and one practice item. Each item started with a short scene-setting passage followed by a dialogue between two interlocutors. The scene-setting passage introduced the two interlocutors and conveyed information about the dialogue’s context. The dialogue comprised two turns: an assertion and a response to it. The response was composed of a response particle and a follow-up phrase, which clearly indicated whether the response was affirming or rejecting the assertion.

In all experimental items, the assertion had positive polarity (see the sample item in (11)). There were eight versions of each experimental item. The response particle was either *ja* or *nein*. The follow-up phrase of the response was either affirming (positive polarity of follow-up phrase) or rejecting (negative polarity of follow-up phrase). The final sentence of the scene-setting passage included an embedded question which served to convey the dialogue’s context and either had positive polarity or negative polarity, intended to induce a salient positive propDR or a salient negative propDR, respectively. In half of the experimental items, the embedded question established broad VP focus for the assertion (i.e., the antecedent of the response), for example, *[sown the lawn]* in (11). In the other half of the experimental items, the embedded question was an object-focus question, for example, *They are talking about which animals the vet has vaccinated already/hasn’t vaccinated yet.*

**Antecedent:** *The vet has vaccinated [the cats]*

*already.*
Sample experimental item of Experiment 1

Setting
Ludwig und Hildegard lassen ihren großen Garten neu gestalten.
Ludwig and Hildegard let their large garden newly designed
'Ludwig and Hildegard have their large garden redesigned.'

Positive context: Sie sprechen darüber, was der Gärtner schon gemacht hat.
they talk about it what the gardener already done has
'They are talking about what the gardener has done already.'

Negative context: Sie sprechen darüber, was der Gärtner noch nicht gemacht hat.
they talk about it what the gardener yet not done has
'They are talking about what the gardener hasn’t done yet.'

Dialogue
Ludwig: Der Gärtner hat den Rasen schon gesät.
the gardener has the lawn already sown
'The gardener has sown the lawn already.'

Hildegard: Affirming: Ja/Nein, er hat den Rasen schon gesät.
yes/no he has the lawn already sown
'Yes/No, he has sown the lawn already.'

Rejecting: Ja/Nein, er hat den Rasen noch nicht gesät.
yes/no he has the lawn yet not sown
'Yes/No, he hasn’t sown the lawn yet.'

All embedded questions, assertions, and follow-up phrases of the responses were in present perfect tense and contained a temporal adverb, either schon ('already'), in clauses with positive polarity, or noch ('yet'), in clauses with negative polarity. The subject of each assertion was identical to the subject of the corresponding embedded question. It was either a single person, referred to by a proper name or a role description, or it was a group of people, referred to by a role description. All assertions had a transitive verb and a direct object. Each follow-up phrase matched its corresponding assertion, except
that the subject was realized as a pronoun and that the polarity of the follow-up phrase was either identical or opposite to the polarity of the assertion, depending on the given version. The two interlocutors either were two females, or two males, or a female and a male. The gender of the asserting and the responding person was balanced across items.

The filler items all had negative assertions. Across all filler items, the polarity of the critical context information, the response particle, and the response type (affirming/rejecting) were counterbalanced.

To encourage the participants to read each item carefully, all items were followed by a verification statement. For eight items (six experimental and two filler items), the verification statement pertained to the critical context information; for the remaining items, it pertained to other information of the scene-setting passage or to the dialogue. True and false statements were equally distributed over all 64 items.

**Design and Procedure** Experiment 1 employed a 2x2x2 within-subject design with the factors CONTEXT (positive/negative), RESPONSE PARTICLE (*ja/nein*), and RESPONSE TYPE (affirming/rejecting). Participants were randomly assigned to eight groups of six participants each, and the experimental items were assigned to eight sets of six items each. The eight conditions were allotted to sets and participant groups according to the counterbalancing schema for complex within-subject designs suggested by Pollatsek & Well (1995: 793). Thus, each participant was presented with each item only once, in one of the eight conditions, and each participant received six items per condition.⁹ Experimental and filler items were presented to the participants in six different mixed orders.

Each item was presented on a computer screen in three parts. Participants were instructed to read each part carefully. By performing a mouse click, they proceeded to the next part, which was presented below the preceding part. Each item started with the presentation of the scene-setting passage. This was followed successively by the two parts of the dialogue, that is, the assertion and the response. Both were placed in a speech bubble, which was tagged by the name of the speaker. After reading the response, participants again had to perform a mouse click which caused the appearance of

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⁹ The number of items per condition for each participant (n=6) and the number of data points per condition for each item (n=6) were the same in all four experiments.
a 7-point rating scale.\textsuperscript{10} The participants’ task was to judge the naturalness and suitability of the response in the given dialogue and context by taking into consideration the information from the scene-setting passage as well as the assertion and response. They were instructed to take the follow-up phrase of the response as indicative of the responding person’s knowledge about the asserted state of affairs. After entering the judgment, the item and the rating scale disappeared from the screen and were replaced by the verification statement. Participants had to indicate whether the statement was correct or incorrect of the given item.

Participants were tested in group sessions, with two to eleven participants per session. They were seated in such a way that they could not read the information on another participant’s screen. The procedure was illustrated by means of one practice trial. The experimental session lasted approximately 60 min.

3.1.2 Results and Discussion

For all statistical analyses reported in this paper, numbers were assigned to the ratings, from 1 for ‘very bad’ to 7 for ‘very good’. The distributions of the ratings in the eight conditions are shown in Figure 1. All analyses reported in this paper were conducted by using cumulative link mixed models (R package \texttt{ordinal}) with random intercepts for participants. Table 4 shows the results of the analyses of the rating data obtained in Experiment 1. To summarize, the model for the full data set yielded significant interactions between \textsc{response type} and \textsc{response particle} and between \textsc{context}, \textsc{response type}, and \textsc{response particle}. Separate analyses for subsets of the data that were conducted to examine the interactions revealed a different pattern for the two response type conditions. For rejecting responses, the ratings were significantly lower for \textit{ja} (\textit{Median} = 1) than for \textit{nein} (\textit{Median} = 7) in both conditions of \textsc{context}. For affirming responses, the ratings were significantly higher for \textit{ja} (\textit{Median} = 7) than for \textit{nein} (\textit{Median} = 1) in both conditions of \textsc{context}. This pattern of results corroborates the uncontroversial predictions for responses to positive antecedents. It confirms the complementary use and interpretation of \textit{ja} and \textit{nein} in affirming and rejecting responses, respectively, to negative antecedents. The effects involving the factor \textsc{context}.

\textsuperscript{10} The scale was a row of seven small round buttons. Only the endpoints were labelled, with \textit{sehr schlecht} (’very good’) and \textit{sehr schlecht} (’very bad’), respectively.
(main effects and interaction effects, see Table 4) were unexpected. Overall, the ratings for responses to positive antecedents were lower in the ‘negative context’ conditions than in the ‘positive context’ conditions, with this effect being modulated by interactions. A possible explanation of this unexpected finding may lie in superficial effects of polarity incongruity versus congruity between the context information, the antecedent assertion, and the response clause. For instance, after the ‘negative context’ sentence *They are talking about what the gardener has not done yet*, the positive antecedent *The gardener has sown the lawn already* is less coherent than it is after the ‘positive context’ sentence (*They are talking about what the gardener has done already*), which may explain the main effect of CONTEXT. This overall effect of CONTEXT may have been mitigated by the polarity of the response clause and by the response particle: the effect was most pronounced for affirming responses with *ja*, that is, when neither of the two dialogue turns nor the response particle was congruent in polarity with the negative context.
Figure 1 Proportions of the ratings per rating level, ranging from 1 (‘very bad’) to 7 (‘very good’), in the eight conditions (CONTEXT x RESPONSE TYPE x RESPONSE PARTICLE) of Experiment 1.
### Table 4  Cumulative link mixed model results for Experiment 1.

<table>
<thead>
<tr>
<th>Fixed effects</th>
<th>$\beta$</th>
<th>SE</th>
<th>z</th>
<th>p-value</th>
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<td>CONTEXT</td>
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<td>RESPONSE TYPE</td>
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<tr>
<td>RESPONSE PARTICLE</td>
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</tr>
<tr>
<td>RESPONSE TYPE $\times$ RESPONSE PARTICLE</td>
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<tr>
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<td>1.64</td>
<td>.42</td>
<td>3.93</td>
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</table>

**Subset: rejecting conditions**

<table>
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<tr>
<th>Fixed effects</th>
<th>$\beta$</th>
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<th>z</th>
<th>p-value</th>
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</thead>
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<td>CONTEXT</td>
<td>.47</td>
<td>.22</td>
<td>2.09</td>
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<tr>
<td>RESPONSE PARTICLE</td>
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<td>.36</td>
<td>-19.90</td>
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<tr>
<td>CONTEXT $\times$ RESPONSE PARTICLE</td>
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<td>-1.99</td>
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<tr>
<td>Subset: positive context RESPONSE PARTICLE</td>
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<td>.61</td>
<td>-14.54</td>
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</tr>
<tr>
<td>Subset: negative context RESPONSE PARTICLE</td>
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<td>.40</td>
<td>-16.27</td>
<td>***</td>
</tr>
</tbody>
</table>

**Subset: affirming conditions**

<table>
<thead>
<tr>
<th>Fixed effects</th>
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<th>SE</th>
<th>z</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
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<td>.81</td>
<td>n.s.</td>
</tr>
<tr>
<td>RESPONSE PARTICLE</td>
<td>7.25</td>
<td>.36</td>
<td>20.22</td>
<td>***</td>
</tr>
<tr>
<td>CONTEXT $\times$ RESPONSE PARTICLE</td>
<td>1.09</td>
<td>.29</td>
<td>3.85</td>
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</tr>
<tr>
<td>Subset: positive context RESPONSE PARTICLE</td>
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<td>.74</td>
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</tr>
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<td>6.99</td>
<td>.43</td>
<td>16.28</td>
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</tr>
</tbody>
</table>

**Note:** $p < .001$, ** $p < .01$, * $p < .05$

### 3.2 Experiment 2: Responses to negative assertions

Experiment 2 addressed the controversial cases of affirming and rejecting responses to negative antecedents. The method was the same as in Experiment 1 and the same materials were used, with the

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11 Reference levels for the fixed effects were ‘negative context’ (for CONTEXT), ‘rejecting’ (for RESPONSE TYPE), and ‘nein’ (for RESPONSE PARTICLE).
exception that the polarity of the antecedent assertions was reversed, that is, it was negative in all experimental items.

3.2.1 Method

Participants Participants were 48 students (19 to 39 years, \( M = 25.33 \); 35 female) from Humboldt-Universität zu Berlin. All were native speakers of German, gave informed consent to participate in the experiment, and received a monetary reimbursement.

Materials The materials comprised 48 experimental items, 16 filler items, and one practice item. The items were the same as those of Experiment 1 with the following modification. In all experimental items of Experiment 2, the assertions had negative polarity (e.g., *Der Gärtner hat den Rasen noch nicht gesät* (′The gardener hasn’t sown the lawn yet′)) and in all filler items, the assertions had positive polarity. As in Experiment 1, there were eight versions of each experimental item: two versions of the dialogue’s context (embedded question with positive or negative polarity), two response particles (*ja* or *nein*), and two versions of the follow-up phrase of the response (affirming or rejecting).

Design and Procedure The design of Experiment 2 was identical to that of Experiment 1, a 2x2x2 within-subject design with the factors CONTEXT (positive/negative), RESPONSE PARTICLE (*ja/nein*), and RESPONSE TYPE (affirming/rejecting). As in Experiment 1, the eight conditions were counterbalanced across eight participant groups and eight sets of items following the procedure suggested by Pollatsek & Well (1995). The procedure was the same as in Experiment 1.

3.2.2 Results and Discussion

Figure 2 shows the distribution of the ratings in the eight conditions of Experiment 2. The results of cumulative link mixed models for the full data set and two subsets are given in Table 5. The analysis of the full data set revealed a significant interaction of RESPONSE TYPE with RESPONSE PARTICLE. To unpack the interactions, separate analyses for the two response type conditions were conducted. For rejecting responses, *ja* (Median = 2 in both context conditions) received significantly lower ratings than *nein* (Median = 6 in both context conditions). For affirming responses, the ratings for *ja* (positive context: Median = 6; negative context: Median = 7) were significantly higher than those for *nein*
(\textit{Median} = 5 in both context conditions). There also was a significant interaction between \textsc{context} and \textsc{response type}. Similar to the unexpected effects involving context that were found in Experiment 1, this interaction may be due to effects of incongruity between the polarity of the critical context sentence, the antecedent and the response clause. The main effect of the context manipulation was significant only for affirming responses (see Table 5), that is, when neither of the two dialogue turns was congruent in polarity with the positive context.

\textbf{Figure 2} Proportions of the ratings per rating level, ranging from 1 (‘very bad’) to 7 (‘very good’), in the eight conditions (\textsc{context} x \textsc{response type} x \textsc{response particle}) of Experiment 2.

For rejecting responses, the data indicate a higher acceptability for \textit{nein} than for \textit{ja}. This finding is inconsistent with Roelofsen & Farkas’s (2015) specific assumptions for German, that is, the proposed blocking characteristic of \textit{doch}, which implies that \textit{ja} and \textit{nein} should not differ in
acceptability because both are assumed to be blocked by *doch*. For affirming responses, the ratings indicate a higher acceptability for *ja* than for *nein*. This finding does not correspond to the prediction of the feature model which was derived from the proposed realization potentials for the German particles in conjunction with general markedness considerations and which implies a preference for *nein* over *ja*.

The results of Experiment 2 are also inconsistent with several predictions of the saliency account, according to which the acceptability pattern for both rejecting and affirming responses should have been affected by the context manipulation. For rejecting responses, the saliency account predicts a higher acceptability for *nein* than for *ja* -- which is supported by the data -- with the difference being larger in the 'negative context' condition (where $\bar{p}_{DR}$, the proposition that is picked up by *nein*, was assumed to be salient) compared with the 'positive context' condition (where $p_{DR}$ was assumed to be salient) -- which is not supported by the data. For affirming responses, the saliency account predicts a higher acceptability for *nein* than for *ja* in contexts with a salient $p_{DR}$ (neutral or positive contexts) and a higher acceptability for *ja* than for *nein* in contexts with a salient $\bar{p}_{DR}$ (i.e., negative contexts) -- which is not confirmed by the data: *ja* received higher acceptability ratings than *nein* independently of context. Thus, neither for affirming nor for rejecting responses were the acceptability patterns affected by the contextual modulation as implied by the saliency account. It is tempting to speculate that the lack of the predicted modulation by context might be due to participants not having properly attended to the critical context information. However, two pieces of evidence rule out this possibility. First, the accuracy rate for the verification statements pertaining to the context information was very high (98%). Second, the significant interaction between CONTEXT and RESPONSE TYPE also clearly indicates that the participants paid close attention to the critical context information.
Table 5  Cumulative link mixed model results for Experiment 2.

<table>
<thead>
<tr>
<th>Fixed effects</th>
<th>$\beta$</th>
<th>$SE$</th>
<th>$z$</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTEXT</td>
<td>-.06</td>
<td>.11</td>
<td>-.54</td>
</tr>
<tr>
<td>RESPONSE TYPE</td>
<td>-.40</td>
<td>.13</td>
<td>-3.03</td>
</tr>
<tr>
<td>RESPONSE PARTICLE</td>
<td>-3.26</td>
<td>.13</td>
<td>-25.71</td>
</tr>
<tr>
<td>CONTEXT $\times$ RESPONSE TYPE</td>
<td>-.38</td>
<td>.16</td>
<td>-2.43</td>
</tr>
<tr>
<td>RESPONSE TYPE $\times$ RESPONSE PARTICLE</td>
<td>4.76</td>
<td>.18</td>
<td>26.80</td>
</tr>
</tbody>
</table>

**Subset: rejecting conditions**

| CONTEXT        | -.06    | .11  | -.58 | n.s. |
| RESPONSE PARTICLE | -3.66    | .15  | -23.79 | *** |

**Subset: affirming conditions**

| CONTEXT        | -.46    | .11  | -4.12 | *** |
| RESPONSE PARTICLE | 1.65    | .12  | 13.63 | *** |

*** $p < .001$, ** $p < .01$, * $p < .05$
Thus, the participants were not homogeneous in their acceptability patterns for affirming responses. For rejecting responses, 43 participants showed the overall pattern of higher median ratings for *nein* compared with *ja*, one participant showed the reverse pattern, and for four participants the median ratings did not differ.

**Figure 3** Experiment 2: Each participant’s median rating for *ja* as an affirming response plotted against the corresponding median rating for *nein*. Dot size indicates the number of participants who share the given pair of median ratings.

**Figure 4** Experiment 2: Each participant’s median rating for *ja* as rejecting response plotted against the corresponding median rating for *nein*. Dot size indicates the number of participants who share the given pair of median ratings.
A tentative possible account for the finding of large inter-individual variation in the acceptability ratings for affirming responses is to assume that there are two groups of speakers for German *ja* and *nein*. If this is indeed the case, speakers of German may be acquainted with two different usage patterns of *ja* and *nein* in affirming responses to negative antecedents. This may also explain why the overall difference between the median ratings for *ja* and *nein* was rather small. The present results stem from acceptability judgments rather than from a production task. When judging acceptability, people may take into account variation that they are accustomed to, such as different uses of response particles. That is, they might not use a particular response particle in a particular condition themselves but may still accept others to use it. As a consequence, some participants in the present experiment may have judged the two particles as equally or near to equally acceptable. We will come back to the interpretation of the individual differences in the acceptability patterns for the affirming answers to negative antecedents in the General Discussion in Section 4 as well as when discussing the results of Experiment 4. Experiment 4 further explored the unpredicted result pattern for affirming responses by testing bare particle responses rather than responses with a full response clause. Previewing the results, the unexpected findings of Experiment 2 in terms of the overall pattern and the inter-individual variation were replicated (see Section 3.4).

### 3.3 Experiment 3: Rejecting responses to negative assertions, including *doch*

Experiment 3 focused on rejecting responses to negative assertions and included the response particle *doch*, the dedicated particle for refusing a negative antecedent, to test whether the higher acceptability of *nein* as compared to *ja* that we obtained for rejecting responses in Experiment 2 might be due to the absence of the particle *doch* in the experimental situation. Therefore, the experimental items of Experiment 3 all contained rejecting responses to negative assertions, and there were three particle levels: *ja*, *nein*, and *doch*. In all other respects, the method was the same as in the previous experiments.

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14 There is some anecdotal evidence for this conjecture, e.g. from discussions between German native speakers on web forums.

15 Note that none of the experiments offered participants a choice between particles in the sense that they were supposed to choose the particle that they thought would fit best in a given context. Each dialogue contained exactly one particle answer which participants had to rate for acceptability. So the absence of *doch* in Experiment 2 did not lead to participants having to make an unnatural choice.
3.3.1 Method

Participants Thirty-six students (19 to 36 years, \(M = 24.64\); 26 female) from Humboldt-Universität zu Berlin participated in the experiment. They were all native speakers of German. They signed informed consent and received a monetary reimbursement for their participation. The data of one additional participant were replaced because of a technical problem (computer crash). The data of two other additional participants were replaced because their accuracy in the verification task was not significantly better than chance.

Materials There were 36 experimental items, 28 filler items, and one practice item. The items were modified versions of those of Experiment 1 and 2. In all experimental items, the assertions had negative polarity and the responses were rejecting (i.e., follow-up-phrases with positive polarity). There were six versions of each experimental item: two versions of the dialogue’s context, embedded question with either positive or negative polarity, and three response particles, either \(ja\) or \(nein\) or \(doch\). Twelve of the filler items contained negative assertions. The remaining 16 filler items contained positive assertions. Across all filler items, the polarity of the critical context information, the response particle, and the response type (affirming/rejecting) were counterbalanced.

Design and Procedure Experiment 3 employed a 2x3 within-subject design with the factors CONTEXT (positive/negative) and RESPONSE PARTICLE (\(ja\)/\(nein\)/\(doch\)). The resulting six conditions were counterbalanced across six participant groups and six sets of items (cf. Pollatsek & Well 1995). The procedure was the same as in Experiment 1 and 2.

3.3.2 Results and Discussion

The distribution of the ratings in the four conditions of Experiment 3 are displayed in Figure 5. The ratings were analyzed with a cumulative link mixed effect model with CONTEXT and RESPONSE PARTICLE as fixed factors.\(^{16}\) The model yielded a significant effect of CONTEXT (\(\beta = -.49, SE = .12, z = -4.07, p < .001\)), with lower ratings in the ‘positive context’ condition than in the ‘negative context’ condition. As expected, \(doch\) (Median = 7 in both context conditions) received the highest ratings and

\(^{16}\) Model comparison yielded no better fit for a model including the RESPONSE PARTICLE-by-CONTEXT interaction. Reference levels were ‘negative context’ (for CONTEXT) and ‘nein’ (for RESPONSE PARTICLE).
*ja* (*Median* = 1 in both context conditions) the lowest ratings; the ratings for *nein* were in between (positive context: *Median* = 3.5; negative context: *Median* = 4). The ratings for *doch* differed significantly from the ratings for *ja* and *nein* (*β* = 5.35, *SE* = .24, *z* = 22.09, *p* < .001) and the ratings for *ja* were significantly different from the ratings for *nein* and *doch* (*β* = -2.81, *SE* = .15, *z* = -18.17, *p* < .001). The latter finding indicates that the finding of Experiment 2 for rejecting responses did not rest upon the absence of *doch* in the experimental situation. Again, the acceptability pattern was not modulated by the context manipulation. However, the main effect of context indicates that the lack of contextual modulation is not due to participants not taking into account the critical context information. With respect to individual variation, participants in Experiment 3 were quite homogeneous in rating *nein* more acceptable than *ja* for rejections, just like the participants in Experiment 2. For 30 participants, the median rating for *nein* was higher than that for *ja*. Two participants showed the reverse pattern, and for four participants, the median ratings did not differ between *ja* and *nein*.

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**Figure 5** Proportions of the ratings per rating level, ranging from 1 (‘very bad’) to 7 (‘very good’), in the six conditions (*CONTEXT × RESPONSE PARTICLE*) of Experiment 3.

### 3.4 Experiment 4: Affirming bare-particle responses to negative assertions

The purpose of Experiment 4 was to investigate whether the unpredicted results obtained for affirming responses in Experiment 2 could be replicated with bare particle responses. Information on whether a
bare *ja* or *nein* should be taken as an affirming response, was provided in the scene-setting passage preceding the dialogue by a description of the epistemological state of the responding person regarding the asserted state of affairs.

A further modification of the material concerned the context manipulation and was motivated by the conjecture that the unexpected effects of context in Experiments 2 and 3 suggest that the dialogues in the ‘positive context’ conditions were perceived as less coherent. To avoid this issue in Experiment 4, the positive context was replaced by a neutral context, in which \( p_{DR} \) was assumed to be salient by default.

3.4.1 Method

**Participants** Participants were 24 students (19 to 33 years, \( M = 23.42 \); 18 female) from Humboldt-Universität zu Berlin. They were all native speakers of German, gave informed consent, and were paid for their participation. The data of one additional participant were replaced because she/he had completed only less than half of the trials after 70 minutes. The data of one other additional participant were replaced because her/his performance on the verification statements of the experimental items was not significantly better than chance.

**Materials** There were 24 experimental items, 40 filler items, and one practice item. The items were modified versions of those of the preceding experiments. The responses were changed to bare particles. The scene-setting passages were modified such that they included information from which it was unequivocally inferable what the responding person knew about the asserted proposition (see (12): *The gardener told Hildegard that he would sow the lawn in a couple of days*). A further modification of the material was the replacement of the positive context version with a neutral context version (see (12)). In the neutral context version, the embedded question in the final sentence of the scene-setting passage was replaced with a prepositional phrase which stated a general topic and explicitly mentioned the subject of the assertion, for instance in (12) the redesigning of the garden by the gardener.

In all experimental items, the assertions had negative polarity and the responses were affirming, that is, the information on the responding person’s knowledge state was consistent with the asserted
proposition. There were four versions of each experimental item: two versions of the dialogue’s context (neutral/negative) and two response particles (ja/nein).

Twenty-four of the 40 filler items also had negative assertions. In all these items, the responses were rejecting, that is, the information on the epistemological state of the responding person was inconsistent with the asserted proposition. The critical context information (neutral or negative) and the response particle (ja or nein) were counterbalanced across these 24 filler items. The remaining 16 filler items had positive assertions. The six combinations of the different versions of context information, response particle, and response type (affirming/rejecting) were evenly distributed over these filler items.

In Experiment 4, the verification statements included statements pertaining to the information from the scene-setting passage on the responding person’s knowledge about the asserted state of affairs (in four experimental items and six filler items).
Sample experimental item of Experiment 4

Setting

Ludwig und Hildegard lassen ihren großen Garten neu gestalten. Hildegard hat sich am Morgen mit dem Gärtner unterhalten, der ihr gesagt hat, dass er den Rasen wetterbedingt erst in ein paar Tagen säen kann.

'Ludwig and Hildegard have their large garden redesigned. This morning, Hildegard talked to the gardener, who told her that because of the weather he would sow the lawn only in a couple of days.'

Neutral context: Beim Mittagessen sprechen Hildegard und Ludwig

during lunch talk Hildegard and Ludwig,
über den Gärtner und die Neugestaltung ihres Gartens.
about the gardener and the redesigning of their garden
'During lunch, Hildegard and Ludwig are talking about the gardener and the redesigning of their garden.'

Negative context: Beim Mittagessen sprechen Hildegard und Ludwig darüber,
during lunch talk Hildegard and Ludwig about it
was der Gärtner noch nicht gemacht hat.
what the gardener yet not done has
'During lunch, Hildegard and Ludwig are talking about what the gardener hasn’t done yet.'

Dialogue

Ludwig: Der Gärtner hat den Rasen noch nicht gesät.
the gardener has the lawn yet not sown
'The gardener hasn’t sown the lawn yet.'

Hildegard: Ja/Nein.
'Yes/No.'
**Design and Procedure** Experiment 4 employed a 2x2 within-subject design with the factors CONTEXT (neutral/negative) and RESPONSE PARTICLE (*ja/nein*). The four conditions were allotted to four sets of items and four participant groups according to the counterbalancing schema for two-factorial within-subject designs as recommended by Pollatsek & Well (1995: 793). The same procedure as in the preceding experiments was applied with the exception that we employed a modified instruction. Participants were informed that the scene-setting passage included information as to what the responding person knows about the asserted state of affairs. They were explicitly asked to consider that information when judging the bare particle response. The instruction included two examples to illustrate how the epistemological state was conveyed in the scene-setting passage.

### 3.4.2 Results and Discussion

Figure 6 shows the distribution of the ratings in the four conditions of Experiment 4. The cumulative link mixed model for the data of Experiment 4 included the fixed factor RESPONSE PARTICLE as the only fixed effect.\(^{17}\) It revealed significantly higher ratings for *ja* (*Median* = 7 in both context conditions) than for *nein* (*Median* = 4 in both context conditions) (*β* = 1.96, *SE* = .17, *z* = 11.44, *p* < .001). This finding replicates the unpredicted results obtained for the affirming conditions of Experiment 2 and extends them to bare particles. As in the previous experiments, there was no interaction effect between CONTEXT and RESPONSE PARTICLE. Different from the previous experiments, there was also no main effect of CONTEXT. This indicates that the replacement of the positive context with a neutral context served its purpose.

\(^{17}\) Model comparison yielded no better fit for models including CONTEXT. The reference level for RESPONSE PARTICLE was ‘*nein*’.
Figure 6 Proportions of the ratings per rating level, ranging from 1 (‘very bad’) to 7 (‘very good’), in the four conditions (CONTEXT TYPE \times RESPONSE PARTICLE) of Experiment 4.

As in Experiment 2, we further explored the overall result by determining each participant’s median rating for *ja* and for *nein* (see Figure 7). Again, the participants were heterogeneous in their acceptability patterns. The majority of the 24 participants ($n=17$) showed the overall pattern of a higher median rating for *ja* than for *nein*. However, seven participants showed the reverse pattern, that is, a higher median rating for *nein* than for *ja*. Thus, the inspection of the individual acceptability patterns in Experiment 4 points in the same direction as in Experiment 2.
General discussion

The present study investigated acceptability patterns for German response particles with a focus on responses to negative antecedents. We considered two theoretical approaches, the feature model proposed by Roelofsen & Farkas (2015) and the saliency account proposed by Krifka (2013). For responses to non-negated antecedents, both approaches make the same predictions: a higher acceptability for *ja* than for *nein* in affirming responses, and vice versa for rejecting responses. Our rating data (Experiment 1) confirmed these generally uncontroversial predictions. Table 6 summarizes the main results in terms of median ratings for all four experiments.
For responses to negative antecedents, the feature model and the saliency account make different predictions. The predictions of the feature model derive from the proposed feature realization potential of the German particles in combination with general markedness considerations as well as the specific assumption for German that *doch* blocks both *ja* and *nein*. The predictions of the saliency account are based on the particles’ proposed meanings and targeted propDRs in combination with assumptions about the relative saliency of the propDRs.

For rejecting responses, the feature model predicts a high acceptability for the dedicated particle *doch*, which realizes the feature combination [REVERSE, +] and no difference between *ja* and *nein*, which both are assumed to be blocked by *doch*. The saliency account predicts that in contexts with a salient pDR (i.e. neutral and positive contexts) *doch*, which targets and asserts pDR, is more acceptable than *nein*, which targets p̅DR and asserts its negation, and *nein* is in turn more acceptable than *ja*, which is blocked by *doch* in targeting pDR. For contexts with a salient p̅DR (i.e., negative contexts), it predicts that *nein* is more acceptable than *doch* which is more acceptable than *ja*. The difference between *nein* and *ja* should be larger in negative contexts, in which the targeted propDR of *nein*, p̅DR, is salient, in comparison to neutral or positive contexts. Contra the predictions of the feature model as well as the
saliency account, our results for rejecting responses to negative antecedents (Experiments 2 and 3) suggest a higher acceptability for *doch* than for *nein* than for *ja*, without contextual modulation.

Turning to affirming responses to negative antecedents, the feature model predicts a high acceptability for *nein*, which realizes the marked feature [-] over *ja*, which realizes the unmarked feature [AGREE]. The saliency account makes the same prediction for neutral and positive contexts, where the salient propDR is *p*DR, which is picked up by *nein*, and predicts the reverse acceptability pattern for negative contexts, where the salient propDR is *p̅*DR, which is picked up by *ja*. Neither of these predictions was confirmed by the rating data obtained in the present study. The results (Experiments 2 and 4) instead point to a higher acceptability for *ja* than for *nein* in affirming responses to negative antecedents, without contextual modulation.

The lack of an interaction between the context manipulation and the particle manipulation for rejecting responses on the one hand, and affirming responses on the other hand, is essentially a null result, which is often delicate to interpret. Yet the lack of the predicted interaction in the present study can be considered to be both interpretable and meaningful. First, it was replicated. Second, as argued before, we can rule out that the method and materials were not sufficiently sensitive to reveal the predicted interaction. Thus, we conclude that the null result does not represent a failure to observe an effect but rather represents a true null effect.18 That is, our findings suggest that preference patterns for German particles in responses to negative antecedents are not affected by the discourse context as it was manipulated in our experimental items that is, with a negative vs. non-negative question in the scene-setting passage – a manipulation that was based directly on concrete suggestions in the saliency account.

To sum up, the present findings cast serious doubts on the empirical validity of both the feature model and the saliency account as applied to German, especially concerning their predictions for affirming responses to negative antecedents. However, as was reported above, a closer data inspection revealed differences between the participants of both Experiment 2 and 4 in their acceptability patterns for affirming responses. Not all participants showed the unexpected overall pattern.19 Some

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18 In this regard, it is noteworthy that a recent study by Goodhue & Wagner (submitted) on English *yes* and *no* also did not find effects of context as predicted by the saliency account.

19 Holmberg (2013, 2015) also reports that there are individual differences between speakers (mainly in
participants showed the predicted pattern of a higher acceptability of *nein* than of *ja*. It is noteworthy that these individual differences are not associated with systematic differences with regard to personal data such as region (place of birth, place where they spent most of their life), age, gender, and handedness.

We tentatively suggested above that the results of our study may indicate that there are two groups of speakers that differ in the way they use response particles in affirming responses to negative antecedents. We also pointed out, however, that there were speakers who did not show a (clear) difference in acceptability between *ja* and *nein*. We proposed that this might be due to the methodology that we applied in our study. It is plausible to assume that in an acceptability judgement task, participants take into account linguistic variation that they encounter in their daily interactions with other speakers, and therefore judge particle responses acceptable that they would not use themselves. So speakers who use *ja* to affirm a negative antecedent might still judge *nein* to be fairly acceptable because they know that other speakers use *nein* for such affirmations, and vice versa. Thus, we assume that the use of a particle by a speaker reflects that speaker's grammar and other individual factors influencing particle choice (for instance, in the revision of the saliency account below we suggest that speakers might differ as to whether there is a difference in salience for them between $\bar{p}_{DR}$ and $p_{DR}$). The acceptance of a particle by a speaker, in contrast, reflects not only his/her grammar and other individual factors influencing particle choice but also his/her knowledge of the pattern of use of response particles by other speakers. We may speculate that the inclination to take into account this kind of knowledge in the experimental situation varies between participants. Of course, the present data cannot provide direct evidence for the existence of two different groups of speakers. However, at present the assumption of two groups seems to be the most straightforward account of the distribution of the individual acceptability patterns that were obtained in two experiments of the present study.

In the next two subsections, we will discuss how the acceptability patterns of the two assumed groups can be accounted for, by considering possible revisions of the feature model and the salience account. Section 5 discusses the observed data patterns in the light of ellipsis theories of response particles, which have not made suggestions that are tailored to the German particle system, but for

responses to negative questions in English) but he does not quantify his results.
which we propose and evaluate adaptations to German.

4.1  *Ja-group* and *nein-group* in the feature model

An obvious way to account for the two groups in the feature model is to assume that the two groups differ in the lexical feature realization potentials for *ja* and *nein*, i.e. that the two groups have different lexical entries for the particles. A reasonable assumption is that in the *ja*-group, *ja* and *nein* realize only relative polarity features, and in the *nein*-group only absolute polarity features, see (13). The realization potential of the dedicated particle *doch* is the same for the two groups: it realizes the feature combination [REVERSE, +].

(13)  **Feature realization potentials of *ja*, *nein* and *doch* for the *ja*-group and the *nein*-group**

<table>
<thead>
<tr>
<th><em>ja</em>-group</th>
<th><em>nein</em>-group</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>ja</em> realizes [AGREE]</td>
<td><em>ja</em> realizes [+]</td>
</tr>
<tr>
<td><em>nein</em> realizes [REVERSE]</td>
<td><em>nein</em> realizes [–]</td>
</tr>
<tr>
<td><em>doch</em> realizes [REVERSE, +]</td>
<td><em>doch</em> realizes [REVERSE, +]</td>
</tr>
</tbody>
</table>

For affirming responses to negative antecedents ([AGREE, –]), (13) implies that the *ja*-group only uses *ja* and the *nein*-group only uses *nein*. For rejecting responses ([REVERSE, +]), the predictions are not straightforward because it is not quite clear if *doch* as a specialized particle for this feature combination still should be assumed to block *ja* and *nein*, or not. After all, in its present form the blocking constraint is not supported by our data. Nevertheless, if we stay with the original assumption in Roelofsen & Farkas, in the *ja*-group *doch* blocks *nein*, and in the *nein*-group *ja* is blocked. We might speculate now that a blocking effect still leads to a higher preference than the inapplicability of a particle, for instance for the *nein*-group *nein* realizes none of the features of [REVERSE, +] and

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20 Note that even if only absolute features are realized, the Pol head always carries both types of features, i.e. also a relative feature, which ensures that the prejacent always highlights the most salient antecedent. For cases where only the absolute feature gets realized the actual value of the relative feature ([REVERSE], [AGREE]) will have to match the polarity relation that follows from the value of the absolute feature and from the polarity of the specific antecedent. Hence, the two feature types are not independent of each other.

21 As we discussed above, we consider use to be different from acceptance. So what we are discussing here and further below are the grammar of the speakers of the two groups including other factors influencing their particle choice.
therefore is ungrammatical in such discourses. This leaves us with the acceptability pattern *doch > nein > ja* for the *ja*-group, and *doch > ja > nein* for the *nein*-group. If we drop the blocking assumption both the *ja*-group and the *nein*-group have two response particle options. The *ja*-group has *doch* and *nein*, which both realize [REVERSE]. The *nein*-group has *doch* and *ja*, which both realize [+]. Markedness considerations do not distinguish between these options. As a consequence, the *ja*-group should find *doch* and *nein* equally acceptable, and the *nein*-group should find *doch* and *ja* equally acceptable. Whether or not the blocking constraint is operative in the grammar of the two groups must be investigated systematically in future research.

There are obviously other ways to revise Roelofsen & Farkas’s feature model. Our discussion has shown that the matter is not entirely straightforward. It might turn out that some further assumptions have to be made to account for the German response particle system. For instance, as already mentioned in Section 2.1, Roelofsen & Farkas (2015) point out that factors like the pressure to avoid ambiguity also influence the preference for particle responses. How exactly these other factors operate in conjunction with the feature model is a matter of future research.

4.2 *Ja-group and nein-group in the saliency account*

Before discussing a possible revision of the saliency account, let us first recall its four main assumptions: 1. Response particles are propositional anaphors that pick up a propDR. 2. Negative antecedents introduce two propDRs, $p^\text{DR}_\text{DR}$ and $p^\text{DR}_{DR}$. 3. These two propDRs differ in saliency. 4. The relative saliency of these propDRs is context-dependent. The results of the present study are silent with regard to the first three assumptions; they can be reconciled with these assumptions but do not directly support them. However, the results are clearly inconsistent with the fourth assumption. This sets the course for revising the saliency account: the fourth assumption needs to be dismissed whereas there are no constraints with regard to the first three assumptions. In our proposed revision of the saliency account, the first two assumptions are maintained, the fourth assumption is dismissed, and the third assumption is maintained but weakened.

One possibility to explain the two groups in the saliency account is to assume a moderate modification, which localizes the differences between speakers in different preferences for picking up
propositional discourse referents. These preferences might result from differences in saliency, i.e. the two groups differ with regard to the relative saliencies they assign to the two propDRs introduced by negative antecedents, $\overline{p}_{\text{DR}}$ and $p_{\text{DR}}$. Here, we discuss the option that for the $ja$-group $\overline{p}_{\text{DR}}$ is more salient than $p_{\text{DR}}$, whereas for the $nein$-group, the two propDRs do not differ in saliency. As for the assumption that for the $ja$-group $\overline{p}_{\text{DR}}$ is more salient than $p_{\text{DR}}$, this may be motivated by the fact that $\overline{p}_{\text{DR}}$ is introduced by a non-embedded constituent, whereas $p_{\text{DR}}$ is introduced by an embedded constituent. There is evidence that discourse referents from embedded constituents are less easily accessible, cf. Gordon, Hendrick, Ledoux & Yang (1999) for embedded DPs, Frazier & Clifton (2005) for embedded clauses, and Syrett & Koev (2015) for appositives. However, this accessibility pattern may not hold for all speakers. Our hypothesis is that the $nein$-group does not show any difference in accessibility. Furthermore, we assume that the processing of double negation overall is difficult and thus a use of a response particle that would involve a double negation reading is dispreferred. In the revised OT account presented below, this dispreference is implemented by the constraint

*DOUBLENEG.

With respect to the lexical entries of the particles we assume with Krifka (2013) that *ja* asserts the propDR which it picks up, whereas *nein* asserts the negation of the targeted propDR. As for *doch*, we deviate from Krifka’s original proposal and assume that *doch* targets $\overline{p}_{\text{DR}}$ and asserts its negation, thus it differs from *nein* by the presupposition that a negated propDR is available. The presupposition of *doch* is part of its conventional meaning (as in Krifka 2013), hence cannot be a conversational implicature. We propose that the presupposition of *doch* is similar to the presupposition of additive particles like *too* (cf. Kripke 2009). Similar to *too*, the presupposition of *doch* is difficult to accommodate. Only in very specific contexts does accommodation seem to be possible, see (14). A’s remark suggests that Peter not being in Berlin is an issue, which licenses the use of *doch*.  

40
(14) A: Ich glaube, Peter war gestern in Berlin.
'I believe Peter was in Berlin yesterday.'

B: Doch, er war in Berlin.
doch he was in Berlin
'Yes, he was in Berlin.'

Note that our assumptions for the meaning of *doch entail that the use of the particle always involves a double negation, i.e., *doch will always violate *DOUBLENEG.

With these assumptions in place, the data pattern observed in the present study can be derived as in the OT tableaux given in Tables 7 and 8 for the *ja-group and the *nein-group, respectively. Note that the PRES constraint from Krifka's original proposal is no longer required to derive the particle preferences. Furthermore, the ranking of *BLOCK and *NONSAL has been changed to capture the data pattern adequately. Finally, we have added a new, highly ranked constraint that we call *TIE. *TIE penalizes combinations of the same form with different meanings that do not differ in any other constraint violation, that is, *TIE makes reference to what is optimal in the system and penalizes the co-occurrence of optimal different meanings for one form. The constraint essentially prohibits ambiguities and can be illustrated in a straightforward way for nominal anaphors. For instance, in a discourse like A man and a boy came in. He sat down., where a man and a boy are equally salient, the pronoun he is ambiguous between two meanings. As a consequence, he cannot be used as an anaphor and the speaker is forced to use an unambiguous anaphoric expression like the boy.

Existing OT treatments of anaphors such as Beaver (2004) do not consider such cases. We propose that the constraint *TIE is well-suited to capture them, as well as the use of response particles (see below).

22 At the moment we are using the OT formalism as a useful tool to describe the data. The proposed ranking seems to describe the data pattern that we obtained by our experimental investigations best. It remains to be seen whether cross-linguistic differences can be described by re-rankings of the constraints.
Turning to the preference patterns for the German response particles and starting with the preferences that are common to both the *ja*- and the *nein*-group, the tableaux in Tables 7 and 8 show that the two
groups do not differ for positive antecedents: *ja* is the optimal choice for affirmations; *nein* is the optimal choice for rejections. There are no constraint violations. As *doch* never targets the positive propDR *p*_{DR} it does not occur in the tableaux parts for positive antecedents. As for negative antecedents, *nein* is dispreferred in targeting *p*_{DR} in both groups, i.e. in being used for rejections, because it is blocked by *doch* as a competitor, that is, *nein* targeting *p*_{DR} violates the constraint *B*LOCK. Recall from section 2.2 that in the present analysis *B*LOCK essentially ensures adherence to the principle Maximize Presupposition. The particle *doch* is the optimal choice for the rejection of negative antecedents. In the revised version *doch* blocks *nein* (rather than *ja*) because now it is *nein* that picks up the same propDR as *doch*. Furthermore, in both groups *ja* violates a higher-ranked constraint than *nein*, so we expect for both groups that the acceptability pattern should be *doch* > *nein* > *ja*, which is different from the patterns predicted by the revised feature model, see 4.1. These different predictions can be contrasted directly in future research.

Turning to the differences between the two groups, for the *ja*-group, *ja* is the optimal choice for affirmations. For this group, the non-embedded propDR *p*_{DR} is salient, which makes both the rejecting interpretation of *ja* and the affirming interpretation of *nein* dispreferred. For the *nein*-group, none of the constraints, excepting *TIE* distinguish between the two meanings of *ja*. That is, *ja* could be used optimally for rejections and for affirmations the reason being that it can pick up two different propDRs, *p*_{DR} or *p*̅_{DR}. As explained above, this kind of ambiguity is avoided: it results in a violation of *TIE*. As a consequence, *ja* cannot be used by the *nein*-group if the antecedent is negative because a negative antecedent provides two propDRs. As a result, *nein* is the optimal form for affirming responses.  

The modified saliency account is based on a number of novel assumptions both theoretical, and empirical, which need to be scrutinized in future research. In particular, the assumption of individual differences with regard to the relation between embeddedness of propDRs and their relative saliencies needs to be tested. A further issue is that the differences between the *ja*-group and the *nein*-group are

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23 An alternative way to explain the unacceptability of *ja* in responses to negative antecedents might be the assumption of a specific presupposition for *ja* such that *ja* presupposes a positive antecedent (see e.g. Ginzburg & Sag (2000, p. 340) for distinct presuppositions for *ja* and *doch*). Note, however, that this proposal would only account for the acceptability pattern of the *nein*-group.
mainly attributed to negation-related processing differences rather than to different response strategies. Note that there is some evidence in the literature that there might be indeed such individual differences (see Herbert & Kißler 2014). A critical test case for the specific assumption of the modified saliency account with regard to the relative saliency of $p_{DR}$ and $\bar{p}_{DR}$ depending on individual processing preferences, which could be part of future research, is the processing of propositional anaphors.

Consider the dialogue in (15):

(15) A: Tom hat das Gemälde nicht gestohlen. ('Tom didn’t steal the painting.')
    B: i. Es gibt viele Leute, die das glauben. ('There are many people who believe that.')
        ii..a. Sie denken, dass er unschuldig ist. ('They think he is innocent.')
        ii..b. Sie denken, dass er schuldig ist. ('They think he is guilty.')</n
A’s negative assertion introduces two propDRs: $\bar{p}_{DR} (\neg \text{steal}(Tom, \text{painting}))$ and $p_{DR} (\text{steal}(Tom, \text{painting}))$. B’s response starts with an utterance containing the ambiguous propositional anaphor das ('that'), which could refer to either of the two propDRs. It is followed by an utterance which is either consistent with resolving the preceding propositional anaphor with $\bar{p}_{DR}$ (ii.a) or with $p_{DR}$ (ii.b). On the basis of the assumptions we made for the two speaker groups in our experiments (for the ja-group $\bar{p}_{DR}$ is more salient, for the nein-group there is no difference in saliency), specific predictions follow for the dialogue in (15). After processing A’s assertion, $\bar{p}_{DR}$ should have a higher mental accessibility than $p_{DR}$ in the ja-group. Hence, the ja-group should be biased to resolve the propositional anaphor in B’s first utterance with $\bar{p}_{DR}$. This should be reflected by shorter processing times and higher acceptability for B’s second utterance when it corresponds to the $\bar{p}_{DR}$-reading of the first utterance (ii.a) compared with the $p_{DR}$-reading (ii.b). For the nein-group, there should be no difference in mental accessibility between $\bar{p}_{DR}$ and $p_{DR}$. Consequently, the nein-group should not be biased with regard to the resolution of the propositional anaphor in B’s first utterance, such that no overall difference in

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24 Herbert & Kißler (2014) present a neuroscientific study on the processing of true versus false negative sentences providing evidence for two processing groups. One group of participants showed more pronounced processing difficulties for false sentences involving a close semantic relation between subject and verb (e.g., Dogs cannot bark.). The other group showed more pronounced processing difficulties for true sentences involving a subject and verb that are unrelated (e.g., Dogs cannot fly.).
processing time and acceptability of B’s second utterance is to be expected.

5 Ellipsis approaches to response particles

In the introductory section we pointed out that there are accounts which consider bare particle answers as instances of ellipsis, so that the particle answers are subject to general syntactic licensing conditions for ellipsis. Such accounts have been proposed for English by Kramer & Rawlins (2010), and for a variety of languages by Holmberg (2013, 2015). Both accounts have been designed to account for response particles that are uttered in response to questions but we take their claims to extend to assertion-response discourses (but see further below for specific assumptions by Holmberg 2015 about responses to assertions). Both Kramer & Rawlins and Holmberg assume that response particles occur in a projection above TP and that the TP is optionally elided. In this section we will review these two accounts and confront them with the German response particles and our experimental findings.²⁵

5.1 Kramer & Rawlins (2010)

Kramer & Rawlins’s (2010) proposal builds on earlier work by Laka (1990) and assumes that there is a polarity phrase ΣP above TP, whose head may be silent or overt. For example; in English, Σ may be $\emptyset$, or not or so, as in if not/so… and maybe not/so. In German, the response particles ja and nein themselves are plausibly Σ heads as is evident for instance by their occurrence below conditional if (wenn ja…, wenn nein…), which in English is not possible (*if yes…, *if no) (Krifka 2013)²⁶. The English particles yes and no adjoin to ΣP. A Σ head in general may come with or without an [E]-feature. The [E]-feature was first proposed by Merchant (2001) to be essential in the licensing of ellipsis. In TP ellipsis, the [E]-feature occurs on the head taking the TP as a complement, prevents the PF spellout of the TP, and requires that the context provides an antecedent for the TP which entails and is entailed by the TP once focussed constituents are taken care of by F-closure (Schwarzschild 1999). In the case of response particle answers, the mutual entailment condition boils down to a

²⁵ See Krifka (2013) and Roelofsen and Farkas (2015) for discussions of these accounts, which also highlight certain shortcomings that do not specifically concern the German answer system.

²⁶ But Textor (2011) argues that if yes…, if no ... does occur in English, but hints that German wenn ja..., wenn nein.... is more frequent. This is corroborated by Google n-grams searches, which also reveal that if yes / no increased dramatically in frequency since 1940.
semantic identity condition, which means that when a bare particle is used as a response to a negative antecedent, there must be negation in the ellipsis site.

Kramer & Rawlins take the interplay of the choice of response particle and the shape and thus meaning of the TP to be a consequence of the featural setup of the clause. The particle no has an uninterpretable negative polarity feature, uNEG, the particle yes has no polarity feature. The uNEG feature on no forms a chain with NEG features further down in the clause, viz., with NEG on the negative Σ head, and with NEG on the NegP head of clausal negation. The NEG features on Σ and on Neg can be interpretable (iNEG) or uninterpretable (uNEG) but exactly one of them must be interpretable. Evidence for the latter assumption comes from the observation that sentences like No, he is not coming do not have a double negation reading, that is, there is negative concord. The interpretable feature is the one that is lowest in the clause provided that this does not violate the semantic identity condition. Consider (16) and (17), which are two dialogues with declarative antecedents that are modelled on dialogues with interrogative antecedents in Kramer & Rawlins (2010). In (16), where the antecedent is negative, the NEG feature on the NEG head inside the TP is interpretable, which conforms with the semantic identity condition. In (17), where the antecedent is positive, the NEG feature on the Σ head is interpretable because the lower NEG feature cannot be interpretable due to the semantic identity condition – there must not be an interpretable clausal negation here because the antecedent is positive. Recall that the identity condition is a semantic one, not a syntactic one, so the presence of the uninterpretable negation in the elided TP does not violate the identity condition.

(16) a. A: Alfonso is not coming to the party.
   B: No. (= He is not coming to the party.)

b. [ΣP no[uNEG] [ΣP Σ[uNEG, E]] [TP he [NegP NEG[iNEG] [is coming to the party]]]]]

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27 The features here are formal syntactic features and can be uninterpretable or interpretable, that is, they are different from the features in Roelofsen & Farkas.
(17) a. A: Alfonso is coming to the party.
    B: No. (= He is not coming to the party.)

    b. \[[\Sigma P no_{uNeg}] [\Sigma iNeg,E] [TP he [NegP NEG_{uNeg} [is coming to the party]]]]\]

    The assumption that no always has an uninterpretable NEG feature indicates that no does not have a
denotation which directly reflects its function as a polarity particle, for example, by taking a positive
proposition as argument and returning a negated one and vice versa. Rather no indicates that there is a
negation somewhere lower in the clause: either in the TP (in the case of negative antecedents) or in the
\(\Sigma P\) (in the case of positive antecedents). This view of no is reminiscent of the presuppositional
meaning of the absolute polarity feature \([-\) of Roelofsen & Farkas (2015). The positive polarity
feature \([+\) of Roelofsen of Farkas, however, finds no direct counterpart in Kramer & Rawlins (2010):
yes has no polarity feature, and the \(\Sigma\) head in positive clauses does neither. So essentially the meaning
of a bare yes response is that of the antecedent clause, see (18).

(18) a. A: Alfonso is not coming to the party.
    B: Yes. (= He is not coming to the party.)

    b. \[[\Sigma P yes [\Sigma iE] [TP he [NegP NEG_{uNeg} [is coming to the party]]]]\]

    Kramer & Rawlins’s proposal does not account for cases where a negative antecedent is rejected and
the elided TP must be assumed either to be positive or to have an uninterpretable NEG feature. Kramer
& Rawlins tentatively assume that in rejecting responses to negative antecedents the answer particles
(both yes and no) have a special reversing feature, which manifests itself in a marked intonation and
does not license ellipsis of the TP (only of the vP). Note that this suggestion does not apply to
rejecting responses to positive antecedents like (17).

    In the following we will explore the potential of Kramer & Rawlins’s (2010) proposal to
account for our experimental findings.\(^{28}\) We suggested above that German ja and nein are best

\(^{28}\) We will not discuss doch because Kramer & Rawlins do not offer a detailed analysis for the type of discourse
where doch is used (rejecting responses to negative antecedents).
analyzed as $\Sigma$ heads in Kramer & Rawlins’s account. Being a $\Sigma$ head, *nein* does not have a fixed polarity feature: It may have an interpretable or an uninterpretable NEG feature, which one it has depends on the antecedent because the polarity of the antecedent determines the (im)possibility of an interpretable vs uninterpretable NEG feature in the elided clause due to the semantic identity condition.

Let us first consider our experimental findings for the *nein*-group, that is, the speakers that prefer *nein* as an affirming response to a negative antecedent. With Repp (2009) we assume that clausal negation is a vP adjunct in German. (19) illustrates the syntax of a *nein*-response to a negative antecedent. Here, the TP has the interpretable NEG feature because the antecedent is negative. *Nein* itself has an uninterpretable feature.

\begin{enumerate}
\item[(19)]
\begin{enumerate}
\item A: Bill raucht nicht. (‘Bill does not smoke.’)
\item B: Nein. (= ‘Bill does not smoke.’)
\end{enumerate}
\end{enumerate}

\begin{enumerate}
\item[(b)]
\begin{enumerate}
\item \[\Sigma_P \text{nein}_{\langle \text{Neg},E \rangle} \]\[TP \[v\text{P NEG}_{\langle \text{Neg} \rangle}[v\text{P Bill raucht}]\]\]
\end{enumerate}
\end{enumerate}

It is revealing to compare (19) to a *nein*-answer as a response to a positive antecedent, see (20). We see that in (20), *nein* has an interpretable feature. The reason for this difference is simply that in (19) the elided TP must contain an interpretable negation because of the negative antecedent, whereas in (20) it must not. So, the assumption for English, viz., that *no* has a constant feature set-up, does not carry over to the *nein* of the German *nein*-group (which is the one of the two speaker groups in German that is more similar to English speakers). We may attribute this to the different syntactic status of *nein* vs. *no*, but see below for a qualification of this assumption.

\begin{enumerate}
\item[(20)]
\begin{enumerate}
\item A: Bill raucht. (‘Bill smokes.’)
\item B: Nein. (= ‘Bill does not smoke.’)
\end{enumerate}
\end{enumerate}

\begin{enumerate}
\item[(b)]
\begin{enumerate}
\item \[\Sigma_P \text{nein}_{\langle \text{Neg},E \rangle} \]\[TP \[v\text{P NEG}_{\langle \text{Neg} \rangle}[v\text{P Bill raucht}]\]\]
\end{enumerate}
\end{enumerate}
Turning to the *ja*-group, the syntax of affirming responses to negative antecedents is straightforward:

(21) a. A: Bill raucht nicht. (‘Bill doesn’t smoke.’)

   B: Ja. (= ‘Bill doesn’t smoke.’)

b. $[\exists P \text{ja}] \left[ TP [\exists P \text{NEG[jNeg]}[\exists P \text{Bill raucht}]] \right]

The more interesting question is why the *nein*-group disfavors *ja* and why the *ja*-group disfavors *nein* in affirming responses to negative assertions. Starting with the *ja*-group we must assume that the analysis in (19) above is not easily available to them. One reason might be that *ja*-speakers do not have a *nein* with an uninterpretable NEG feature at their disposal. As a consequence, they end up with a double negation reading for the responses in dialogues like (19), which is not the intended meaning.

The observation that the *nein*-group disfavors *ja* as an affirming response to a negative antecedent is harder to explain in Kramer & Rawlins’s account. Since *ja* has no polarity feature, the shape of the elided TP is essentially irrelevant for the felicity of the response (provided semantic identity is upheld). Assuming a syntactic polarity feature for *ja* is obviously an option but note that the *ja*-group would still have to have a ‘featureless’ *ja*: *ja* can be used as affirmation both for negative and for positive antecedents. Furthermore, whilst negation is well-known for inner-clausal syntactic dependencies, including concord chains, this is much less the case for positive polarity. Therefore, the assumption of a positive polarity feature chain requires careful study beyond these precise instances of *ja*- and *nein*-responses, which is a task that goes beyond the scope of the present paper. Overall it seems that Kramer & Rawlins’s proposal can account for some of the data but its coverage is notably smaller than that of the anaphor accounts.

5.2 Holmberg (2015)

Holmberg’s (2015) is a detailed study of answering systems in many typologically unrelated languages, which attributes the differences between answering systems on the one hand to a different syntax of the response particles themselves, and on the other hand to the availability of different types
of negation in a language. The basic syntactic assumptions for the response particles build on analyses developed in Holmberg (2013; and predecessors), and are fairly similar to Kramer & Rawlins’s.

Like Kramer & Rawlins, Holmberg (2013, 2015) assumes that all sentences contain a polarity phrase whose head (Pol = Σ) takes the TP as complement (cf. Holmberg 2001, 2007). The Pol head enters the derivation with an unvalued polarity feature [±Pol] (Holmberg 2015). In negative assertions, the feature is valued [–Pol] by the Neg head further down in the clause. In positive assertions, Pol receives the default value [+Pol]. In polarity questions, the polarity feature stays unvalued. Response particles occur in the specifier of a higher Foc(us)P. They encode negative and positive polarity features respectively, and form an operator-variable structure with the Pol head, that is, they (also) assign a value to the Pol head. In a question-answer discourse, the PolP of the question is copied and merges with the focused polarity feature encoded by the response particle at hand. The feature then assigns its value to the unvalued Pol head copied from the question. This mechanism is illustrated for English no in (22), where no occurs in an answer to a positive question. No encodes a negative polarity feature, [–Pol], and assigns its value to the unvalued Pol head that is copied from the question.

(22)  A: Does he drink coffee?       B: No. (He doesn’t drink coffee).

B: [FocP [no, –Pol] [PolP he [Pol’ [does, T, –Pol] [TP [VP drink coffee]]]]]

With respect to assertions, Holmberg (2015) points out that this proposal system sometimes does not make the right predictions. Without going into the details here, there are unexpected differences in English and Finnish with respect to what constitutes a possible response to a question vs. an assertion. Therefore, Holmberg proposes that response particles may have quite a different syntax and semantics in questions vs. assertions. Concretely, he proposes for English yes as a response to assertions, that it does not encode a focussed polarity feature but is similar to responses like true or right in that it signals agreement with a preceding statement. Syntactically, it combines with a (valued) PolP, which might be elided. Holmberg calls responses to assertions rejoinders.

Let us apply this system to our results for German ja and nein. First consider (23), which
illustrates the most acceptable answer for affirming responses to negative antecedents in the \textit{nein}-group. The Pol head enters the deviation with the value [–Pol] because the PolP is a copy of the PolP of the negative antecedent. As a consequence, the response particle in Spec.FocP cannot assign its polarity feature value to Pol, see (23b'). For cases like this, Holmberg suggests similarly to Kramer & Rawlins, that there is a different \textit{nein} at play. This other \textit{nein} does not encode a focused polarity feature but comes with an uninterpretable Neg feature, which forms a negative concord chain with the negative Pol head, see (23b').

(23) a. A: Bill raucht nicht. \quad B: Nein. (Er raucht nicht).

'Bill doesn't smoke.' \quad 'No. (He doesn't smoke).'

\begin{itemize}
  \item[b']. $[\text{FocP} \ [\text{nein}, -\text{Pol}]] [\text{PolP} \ [\text{Pol'} \ [\text{raucht}, T, -\text{Pol}]] \ [\text{TP} \ [\text{vP} \ [\text{vP} \ [\text{er raucht}>]]]]]]^{29}$
\end{itemize}

\begin{itemize}
  \item[b'']. $[\text{FocP} \ [\text{nein}, \text{uNeg}]] [\text{PolP} \ [\text{Pol'} \ [\text{raucht}, T, -\text{Pol}]] \ [\text{TP} \ [\text{vP} \ [\text{vP} \ [\text{er raucht}>]]]]]]$
\end{itemize}

Turning to affirming responses to negative antecedents in the \textit{ja}-group, we must assume that the analysis in (23) is not available to them. They prefer \textit{ja} in such discourses. (24) shows that for this group \textit{ja} is parallel to \textit{nein} for the \textit{nein}-group in the sense that it cannot be a particle realizing a focused polarity feature either: the Pol head both in (23) and (24) is already valued [–Pol] in the antecedent. However, unlike for the feature value encoded by \textit{nein}, chain formation is not possible for \textit{ja} due to the different Pol values. Consequently, \textit{ja} must be an agreeing rejoinder for the \textit{ja}-group rather than a response particle.

(24) A: Bill raucht nicht. \quad B: Ja. (Er raucht nicht).

B: $[\text{FocP} \ [\text{ja}, +\text{Pol}]] [\text{PolP} \ [\text{Pol'} \ [\text{raucht}, T, -\text{Pol}]] \ [\text{TP} \ [\text{vP} \ [\text{vP} \ [\text{er raucht}>]]]]]]$

\footnotesize{\textit{We are assuming with Repp (2009) that German sentential negation is a vP adjunct.}}
Moving on to rejections to positive assertions\textsuperscript{30}, recall that all speakers find nein acceptable for these. In (25) we see that nein again cannot be a particle encoding a focused polarity feature: the values of the particle and of the Pol head are different. In (25), nein must be a rejoinder signaling disagreement with the antecedent (like Wrong!).

(25)  
\begin{tabular}{ll}
A: & Bill raucht. \\
B: & Nein. (Er raucht nicht). \\
\end{tabular}

\begin{align*}
\text{B: } \left[ \text{FocP} \left[ \text{Nein, } -\text{Pol} \right] \left[ \text{PolP} \text{ er } [\text{pol}', \text{ +Pol}] \left[ \text{TP} \left[ v_p < \text{er raucht}> \right] \right] \right] \right]
\end{align*}

Note that this is the third nein for the nein-group: rejoinders only are possible in reaction to assertions, not in reactions to questions, compare: A: Does Bill smoke? B: #Wrong! So the nein-group has a nein encoding a focussed negative polarity feature in negative responses to positive polarity questions, it has a nein with an uninterpretable Neg feature, and it has a disagreeing rejoinder nein. The ja-group only has two of these neins: the one that encodes a focussed negative polarity feature and the disagreeing rejoinder nein. In addition, the ja-group has two jas: the agreeing rejoinder one and the focussed positive polarity feature one (in polar questions). Thus although this account describes the data adequately it is not a parsimonious account.\textsuperscript{31}

Overall it seems that despite some partial successes the existing ellipsis accounts either face considerable difficulties in accounting for the German data, or they must assume quite a few different

\textsuperscript{30} We are not discussing rejections of negative assertions here because Holmberg focuses on ja and nein (rather than particles like doch, which are appropriate here, but see Holmberg 2013 on the Swedish counterpart of doch).

\textsuperscript{31} As mentioned above, Holmberg also attributes an important role to different types of negation to explain the preference patterns for response particles. For English, he assumes that in addition to sentential negation in NegP, there may be a negation in the VP. The latter according to Holmberg is too low to value the Pol head, which opens up the possibility that the focussed polarity feature can assign its value to the Pol head in structures where this would not be possible with NegP negation. We will not apply this kind of analysis to German here because the syntax of negation in German and English is quite different. In German, ordinary negation has been argued to be a vP-adjunct (e.g., Repp 2009) whereas in English it is likely to be the head of a NegP higher up in the clause (Holmberg 2013, Repp 2009). So in German, ordinary negation is fairly low already and it seems difficult to explain the data in terms of higher vs. lower negation. Still, note that German has what Holmberg calls low negation in addition to ordinary clausal negation, i.e. it is possible to combine two negations:

(i) Context: The teacher announced that everyone who hadn’t done their homework would have to miss the extra break in the afternoon and do their homework then.
Hildegard war die Einzige, die nicht ihre Hausaufgaben nicht gemacht hat.
Hildegard was the only one who not her homework.pl not done has ‘Hildegard was the only one who hadn’t done her homework.’
versions of the response particles. It seems that the assumption of an ambiguity in the meaning or syntactic feature set-up of a response particle in one and the same speaker is something that is unavoidable in an ellipsis account – both Kramer & Rawlins and Holmberg have integrated such assumptions in their proposals.

6 Conclusion

Experimental studies on the use and interpretation of response particles are sparse. The present series of experiments addressed response particles in German which have not been methodologically investigated so far. The findings were inconsistent with the predictions of two recent theoretical approaches to the German response particles in terms of propositional anaphora, Roelofsen & Farkas’s (2015) feature model and Krifka’s (2013) saliency account. However, the unexpected results were reproducible. Hence, the present study adds to the growing body of evidence for the importance of systematic and controlled quantitative investigations.

A key finding of the current study is that there are differences between participants. On the basis of the data, we suggested that there might be two groups of speakers, who differ in their preference patterns for ja and nein in affirming responses to negative assertions. Clearly, more, and different types of, data is needed to further explore and define the existence and nature of different groups of speakers. This includes the investigation of the awareness of the different groups of speakers of each other, and the consistency of individual speakers within and across different linguistic tasks (e.g., interpretation vs. production) and different types of antecedents (e.g., assertions vs. questions. Furthermore, future research must include the investigation of the prosody of particle responses, which in recent studies on English and Catalan has been shown to play an important role (Goodhue & Wagner 2013, 2015, González-Fuente, Tubau, Espinal & Prieto 2015). A further highly relevant task of future research is to pinpoint the effects of factors such as negation scope and bias of polar questions (e.g., Romero & Han 2004, Sudo 2013), the latter being an issue that we have not addressed here at all.

To account for the acceptability ratings of the ja-group and the nein-group, we discussed possible revisions of the feature model and the saliency account, as well as of ellipsis accounts. It
remains an empirical task to evaluate the scope and value of these revisions. We have put forward in our discussion directions for future research that would address questions arising from our proposed revisions, and that should help us decide on the most adequate account of the German particle system. This endeavour may necessitate detailed assumptions on the processing and representation of negation as well as on the various processes involved in the choice and interpretation of response particles. It may turn out that the most valid account is one that succeeds in integrating processing insights in addition to theoretical insights from different approaches.

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