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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 acceptability-judgment experiments that collected preference 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 were two groups of participants that differed in their preference pattern for affirming responses to negative antecedents. 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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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. For instance, the use of English *yes* and *no* is complementary only with positive antecedents, for example, assertions without sentential negation as in (1). A *yes* response unequivocally affirms and a *no* response unequivocally 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 negative[1] 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 which of the three German answer particles is preferred in discourses like (1) and (2) by experimental investigation, and discusses the theoretical implications of the findings.

Cross-linguistically, a distinction has been made between two major answering systems (Pope 1976), so-called *polarity-based systems* and *truth-based systems*. In polarity-based systems, the choice of response particles is determined by the polarity of the response clause. That is, in such systems, a

[1] Throughout this paper, we use the term *negative* in the restricted sense of sentential negation/negation with highest scope in the clause.

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. English is commonly classified as a polarity-based system (e.g., Pope 1976, Jones 1999). An example of a language with a truth-based system is Japanese (e.g., Kuno 1973). A language with three response particles like German can neither have a purely polarity-based system nor a purely truth-based system.

The classification of English as a language with a polarity-based answering system may appear ill-founded considering the range of uses of *yes* and *no* as exhibited in (2). However, even though both *yes* and *no* can be used in responses to negative antecedents, there are preference differences between the two response particles, as revealed by experimental studies. In line with the polarity-based classification, it has been shown that *no* is preferred over *yes* in affirming responses to negative antecedents, that is, negative response clauses (Brasoveanou, Farkas & Roelofsen 2013, Goodhue, Pickett, & Wagner 2013, Goodhue, & Wagner 2015).

In recent years, detailed theoretical analyses of response particles have been put forward. These 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). 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 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 response 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 (e.g., Blühdorn 2012: 386). *Doch* is a specialized particle which is typically used for rejecting responses to negative antecedents.[2]

(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*

[2] 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).

days, Bill doesn't smoke) the use of response particles corresponds to their use for antecedents without negation[3] (as in (3)), that is, *ja* and *nein* are complementary and *doch* is not licit.

Roelofsen & Farkas (2015) and Krifka (2013) analyse 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 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)

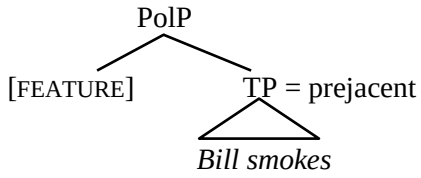
The syntactic-semantic feature model proposed by Roelofsen and Farkas (2015) is framed in terms of inquisitive semantics, which provides a fine-grained framework to distinguish different types of polar antecedents. The model draws on Farkas & Bruce's (2010) commitment based discourse model and builds on Pope's (1976) 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

[3] Findings from the study by 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.

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). Roughly speaking, a highlighted possibility is a salient propositional discourse referent which is introduced by an utterance in the preceding discourse and which constitutes a potential antecedent for subsequent anaphoric expressions. The relative polarity features ([AGREE] and [REVERSE]) pose a presupposition on the semantic relation between the prejacent and the antecedent: [AGREE] and [REVERSE] "presuppose that their prejacent highlights a unique possibility α, and that the discourse context contains a unique most salient antecedent possibility β such that α agrees with/reverses β, 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. 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, +]), Roelofsen & Farkas assume that the specialized particle *doch* blocks *nein* and *ja*, that is, the feature combination [REVERSE, +] can only be realized by *doch*.

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 analyses *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. The latter are assumed to introduce two propDRs, as illustrated in (8).

(8) ⟦ [Bill [$\bar{p}_{DR}$ t_{Bill} doesn't [p_{DR} t_{Bill} smoke]]] ⟧ = ¬(smoke(Bill))

$\bar{p}_{DR}$, i.e., negative propDR: ¬(smoke(Bill))

p_{DR}, i.e., positive propDR: smoke(Bill)

The negative propDR, henceforth $\bar{p}_{DR}$, is the negated proposition established by the antecedent. The positive propDR, henceforth p_{DR}, is the positive proposition in the scope of the negation operator. $\bar{p}_{DR}$ and p_{DR} can both be picked up by anaphora (cf. … *Mary knows that* ($\bar{p}_{DR}$) vs. *Mary would have known that* (p_{DR})), including the propositional anaphora *ja*, *nein*, and *doch*. The particle *doch* comes with the presupposition that both $\bar{p}_{DR}$ and p_{DR} are salient and that *doch* picks up p_{DR} and asserts it, thereby blocking *ja* in picking up p_{DR} 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 $\bar{p}_{DR}$, and *nein* picking up p_{DR} and asserting its negation.

	Particle	**Targeted propDR**	**Meaning**		**Response type**
Positive antecedents (e.g., *Bill smokes*)	*ja*	p_{DR}	p_{DR}	e.g., smoke(Bill)	affirmation
	nein	p_{DR}	$\neg p_{DR}$	e.g., ¬(smoke(Bill))	rejection
Negative antecedents (e.g., *Bill doesn't smoke*)	*ja*	$\bar{p}_{DR}$	$\bar{p}_{DR}$	e.g., ¬(smoke(Bill))	affirmation
	nein	$\bar{p}_{DR}$	$\neg\bar{p}_{DR}$	e.g., smoke(Bill)	rejection
		p_{DR}	$\neg p_{DR}$	e.g., ¬(smoke(Bill))	affirmation
	doch	p_{DR}	p_{DR}	e.g., smoke(Bill)	rejection

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

Regarding the relative saliency of $\bar{p}_{DR}$ and p_{DR}, Krifka proposes that p_{DR} (e.g., *smoke(Bill)*) is by default more salient than $\bar{p}_{DR}$ (e.g., ¬*(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., *smoke(Bill)*) and asserts its negation, whereas *ja* picks up $\bar{p}_{DR}$ (e.g., ¬*(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., ¬*(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 and their effects on the preference pattern of the German response particles is given in (10).

(10) a. *NONSAL: Penalizes picking up a less salient discourse referent.

b. PRES: Penalizes picking up $\bar{p}_{DR}$ by *doch*

c. *BLOCK: Blocks *ja* in picking up p_{DR} (meta-constraint)

*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). In the case at hand, *BLOCK has the effect that the optimal form-meaning pair *doch*, p_{DR} suppresses the use of *ja* to express the same meaning, p_{DR}. The blocking of *ja* in this case can also be motivated by a pragmatic rule, "Maximize Presupposition" (cf. Heim 1991); notice that *doch* carries a presupposition that *ja* doesn't. So the effect of *BLOCK can also be achieved by replacing *BLOCK by a constraint MAXPRESUP in the present case. 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.

Particle	Targeted propDR	Meaning		*BLOCK	PRES	*NONSAL	
Salient propDR = p_{DR}							
ja	p_{DR}	p_{DR}	= rejecting	*			
	$\bar{p}_{DR}$	$\bar{p}_{DR}$	= affirming			*	
nein	p_{DR}	$\neg p_{DR}$	= affirming				☜
	$\bar{p}_{DR}$	$\neg \bar{p}_{DR}$	= rejecting			*	
doch	p_{DR}	p_{DR}	= rejecting				☜
	$\bar{p}_{DR}$	$\bar{p}_{DR}$	= affirming		*	*	
Salient propDR = $\bar{p}_{DR}$							
ja	p_{DR}	p_{DR}	= rejecting	*		*	
	$\bar{p}_{DR}$	$\bar{p}_{DR}$	= affirming				☜
nein	p_{DR}	$\neg p_{DR}$	= affirming			*	
	$\bar{p}_{DR}$	$\neg \bar{p}_{DR}$	= rejecting				☜
doch	p_{DR}	p_{DR}	= rejecting			*	
	$\bar{p}_{DR}$	$\bar{p}_{DR}$	= affirming		*		

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 (p_{DR} for rejecting responses; $\bar{p}_{DR}$ for affirming responses).[4]

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

Let us sum up and juxtapose 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

[4] 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, $\bar{p}_{DR}$, 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.

Response type	**Context**	**Predicted preference patterns**	
		Saliency account	**Feature model**
Rejecting	Positive (default)	*doch* > *nein* > *ja*	*doch* > *nein* = *ja*
	Negative	*nein* > *doch* > *ja*	
Affirming	Positive (default)	*nein* > *ja*	*nein* > *ja*
	Negative	*ja* > *nein*	

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 preference 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 preference 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).

We conducted four acceptability-judgment 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 contained information on the dialogue's context, that is, what the two interlocutors were talking about. 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 preference patterns for *ja* and *nein* in affirming and rejecting full-clause responses to negative assertions. Experiment 3 focussed 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 $\bar{p}_{DR}$ (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 tested the preference patterns for *ja* and *nein* in responses to positive assertions. Here, the predictions of the feature model and the saliency account are non-contentious. With affirming responses, there should be a strong preference for *ja*, which should be reflected in higher ratings for *ja* compared with *nein*. This pattern is predicted to be reversed with rejecting responses. These preference 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*]$_F$ 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]$_F$ already*).

(11) **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, and the experimental items were assigned to eight sets. 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). 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 a 7-point rating scale. The scale ranged from 1 (very bad) to 7 (very good). 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 (two to eleven participants per group). The procedure was illustrated by means of one practice trial. The experimental session lasted approximately 60 min.

3.1.2 Results and Discussion

The mean ratings in the eight conditions of Experiment 1 are displayed in Figure 1. All analyses reported in this paper were conducted by linear mixed-effects modelling with backward model selection and the deviation coding scheme (0.5, -0.5) for all fixed factors with two levels. For Experiment 1, this resulted in a final model with by-subject random intercepts and by-subject random slopes for RESPONSE TYPE, RESPONSE PARTICLE, and their interaction. The final model included all three fixed factors, that is, RESPONSE TYPE, RESPONSE PARTICLE, and CONTEXT, and their interactions. The effects of RESPONSE TYPE (b=0.02, SE=0.07, t=0.32), RESPONSE PARTICLE (b=-0. 09, SE=0.08, t=-1.19), and the interaction between RESPONSE PARTICLE and CONTEXT (b=-0.11, SE=0.06, t=-1.88) were not significant. There was a significant effect of CONTEXT (b=-0.14, SE=0.03, t=-4.78), and significant interactions of CONTEXT with RESPONSE TYPE (b=0.29, SE=0.06, t=4.84), and of RESPONSE TYPE with RESPONSE PARTICLE (b=-10.35, SE=0.27, t=-37.67). The three-way interaction between CONTEXT, RESPONSE TYPE, and RESPONSE PARTICLE was also significant (b=0.70, SE=0.12, t=5.89). To examine the interactions, the data for the two response type conditions were analyzed separately. The model for the rejecting responses revealed no significant effect of CONTEXT (b=-0.002, SE=0.04, t=0.04). However, there was a significant effect of RESPONSE PARTICLE (b=-5.27, SE=0.17, t=-31.16) and a significant interaction between RESPONSE PARTICLE and CONTEXT (b=0.24, SE=0.08, t=2.91). Separate analyses for the two context conditions indicated that the effect of RESPONSE PARTICLE was significant in both context conditions, with higher ratings for *nein* than for *ja* (see Table 4). However, the effect of RESPONSE PARTICLE was higher with positive contexts (b=-5.39, SE=0.16, t=-32.73) compared with negative contexts (b=-5.15, SE=0.19, t=-27.11). The model for affirming responses

indicated a significant effect of CONTEXT (*b*=-0.29, *SE*=0.04, *t*=-6.64) and a significant effect of RESPONSE PARTICLE (*b*=5.09, *SE*=0.14, *t*=35.56). Moreover, there was a significant interaction between RESPONSE PARTICLE and CONTEXT (*b*=-0.47, *SE*=0.09, *t*=-5.36). Breaking up this interaction yielded for both context conditions a significant effect of RESPONSE PARTICLE, with higher ratings for *ja* than for *nein*. The effect of RESPONSE PARTICLE was higher with positive contexts (*b*=5.32, *SE*=0.12, *t*=42.75) compared with negative contexts (*b*=4.85, *SE*=0.18, *t*=26.80).

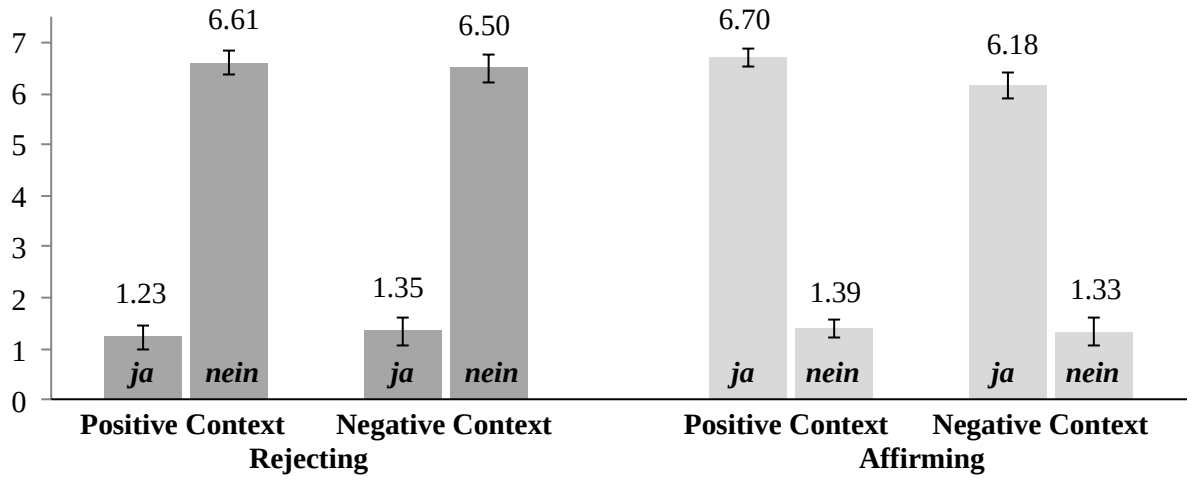


Figure 1 Mean ratings as a function of CONTEXT, RESPONSE TYPE, and RESPONSE PARTICLE in Experiment 1. Error bars represent within-subject 95% confidence intervals (Masson & Loftus 2003) associated with the particle effect in the respective context and response polarity condition. The numbers above the bars are the condition means.

Overall, the results confirm the uncontroversial predictions for responses to positive antecedents in that they suggest a strong preference for *nein* in rejecting responses and a strong preference for *ja* in affirming responses. The effects involving the factor CONTEXT were unexpected, but may partially be explained by superficial effects of polarity incongruity between the context information, the antecedent assertion, and the response clause. Overall, responses to positive antecedents were rated lower in the 'negative context' conditions than in the 'positive context' conditions, with this effect

being modulated by interactions. The effect of CONTEXT was significant for affirming responses, in which not only the antecedent assertion had positive polarity but also the response clause, that is, when neither of the two dialogue turns was congruent in polarity with the negative context. For rejecting responses, that is, for response clauses with negative polarity, the decrease of the ratings in the 'negative context' conditions may have been mitigated by the presence of at least one dialogue turn (the response) that corresponded in polarity to the negative context. For both response types, the differences between *ja* and *nein* were as predicted and they were large in both context conditions. The fact that the differences were largest in the 'positive context' conditions may be due to that these conditions constitute a canonical context for antecedent assertions with positive polarity but not for antecedent assertions with negative polarity.

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 exception that the polarity of the antecedent assertions was reversed.

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 mean ratings in the eight conditions of Experiment 2. The analysis of the data resulted in a final model with by-subject random intercepts and by-subject random slopes for RESPONSE TYPE, RESPONSE PARTICLE, and their interaction, and included all three fixed factors (CONTEXT, RESPONSE TYPE, and RESPONSE PARTICLE) and the two-way interactions between CONTEXT and RESPONSE TYPE and between RESPONSE TYPE and RESPONSE PARTICLE. This model indicated significant effects of CONTEXT (b=0.20, SE=0.04, t=4.65), of RESPONSE TYPE (b=1.72, SE=0.17, t=9.96), and of RESPONSE PARTICLE (b=-0.97, SE=0.18, t=-5.49). These effects were qualified by significant interactions of CONTEXT with RESPONSE TYPE (b=0.30, SE=0.08, t=3.42), and of RESPONSE TYPE with RESPONSE PARTICLE (b=4.52, SE=0.49, t=9.32). To unpack the interactions separate analyses for the two response type conditions were conducted. The model for rejecting responses did not reveal a significant effect of CONTEXT (b=0.05, SE=0.06, t=0.92). The effect of RESPONSE PARTICLE was significant (b=-3.23, SE=0.30, t=- 10.70). As displayed in Table 4, *nein* received higher ratings than *ja*. The model for affirming responses indicated a significant effect of CONTEXT (b=0.34, SE=0.06, t=5.44); ratings were lower in the 'positive context' conditions than in the 'negative context' conditions. Moreover, there was a significant effect of RESPONSE PARTICLE (b=1.29, SE=0.30, t=4.34) with higher ratings for *ja* than for *nein*.

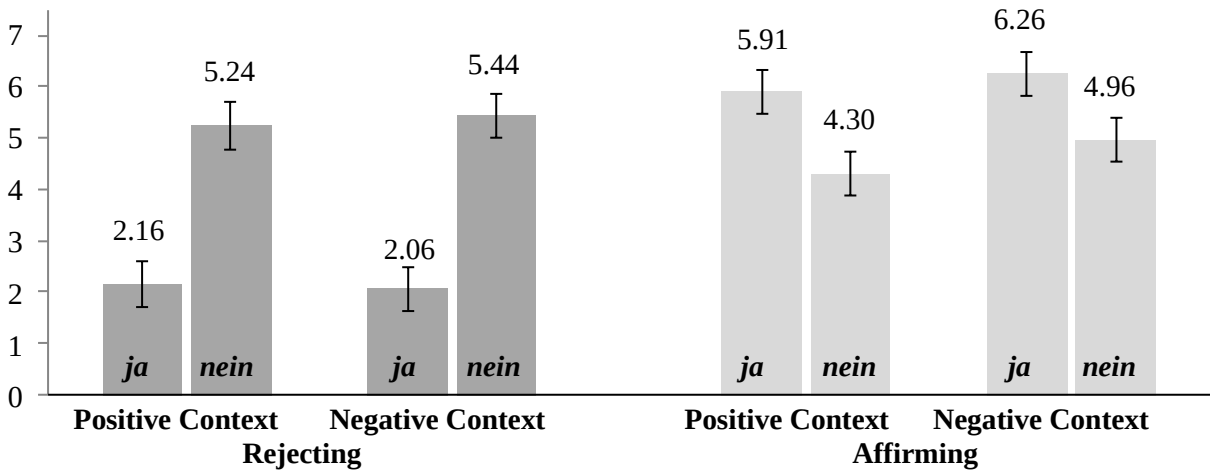


Figure 2 Mean ratings as a function of CONTEXT, RESPONSE TYPE, and RESPONSE PARTICLE in Experiment 2. Error bars represent within-subject 95% confidence intervals (Masson & Loftus 2003) associated with the particle effect in the respective context and response polarity condition. The numbers above the bars are the condition means.

The results of Experiment 2 neither correspond to the predictions by the feature model nor to the predictions by the saliency account. For rejecting responses, the data indicate a general and context-independent preference for *nein* over *ja*. This finding is inconsistent with the feature model, which predicted that both *ja* and *nein* should be strongly dispreferred because *doch* is the dedicated particle for these discourses, blocking the other two particles. The finding is also inconsistent with the saliency account, according to which the preference pattern should have been affected by the context manipulation. That is, the preference for *nein* over *ja* was predicted to be 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). We investigated the findings for rejecting responses further in Experiment 3, see Section 3.3, where the response particle *doch* was added as a factor level.

The data for the affirming responses indicate a context-independent preference for *ja* over *nein*.

This pattern of results is inconsistent with the feature model, which predicted a general preference for *nein* over *ja*, and it is inconsistent with the saliency account, which predicted a preference for *nein* over *ja* in contexts with a salient p_{DR} (neutral or positive contexts) and a preference for *ja* over *nein* in contexts with a salient $\bar{p}_{DR}$ (i.e., negative contexts). In Experiment 4, see Section 3.4, we further explored the unpredicted result pattern for affirming responses to negative assertions in discourses with bare particle responses rather than with particle responses followed by a full response clause.

Similar to Experiment 1, the results of Experiment 2 indicate a rating decrease when the polarity of the antecedent assertion is incongruent with the polarity of the context information. Thus, in Experiment 2, where the assertions had negative polarity, the ratings were overall lower in the 'positive context' conditions compared with the 'negative context' conditions. As in Experiment 1, the main effect of the context manipulation was significant only for affirming responses, that is, when neither of the two dialogue turns was congruent in polarity with the positive context. The difference between the two response types with regard to the effect of the context manipulation may be explained by the same line of reasoning as applied to the results of Experiment 1: The rejecting responses in Experiment 2 had positive polarity and thus corresponded in polarity to the positive context, which may have weakened the tendency for lower ratings in the 'positive context' conditions.

Neither for affirming nor for rejecting responses did an interaction obtain between CONTEXT and RESPONSE PARTICLE, contra the predictions by the saliency account. It is tempting to speculate that the lack of the predicted interaction 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, there was a significant main effect of CONTEXT for the affirming responses in Experiment 2 (similar to the effect of context obtained in Experiment 1). The main effect of CONTEXT clearly indicates that the participants paid close attention to the critical context information.

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 strong preference

for *nein* over *ja* 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.

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

Linear mixed-effects modelling resulted in a model with the two main effects of the fixed factors RESPONSE PARTICLE and CONTEXT, by-subject random intercepts, and by-subject random slopes for RESPONSE PARTICLE and for CONTEXT.[5] For the three level factor RESPONSE PARTICLE, two contrasts were used. The first contrast tested whether the *ja* and *nein* conditions were different from each other (contrast 1: *ja*: 0.5, *nein*: -0.5, *doch*: 0), and the second contrast tested whether the *nein* condition was different from the *doch* condition (contrast 2: *ja*: 0, *nein*: -0.5, *doch*: 0.5). As can be seen from Figure 3, *doch* received the highest ratings and ratings for *ja* were lower than ratings for *nein*. This difference was significant (*b*=-4.65, *SE*= 0.30, *t*=-16.06), as was the difference between the rating for *nein* and *doch* (*b*=5.25, *SE*= 0.26, *t*=19.93). There was also a significant effect of CONTEXT (*b*=0.26, *SE*=0.09, *t*=2.87), with lower ratings in the 'positive context' condition than in the 'negative context' condition.

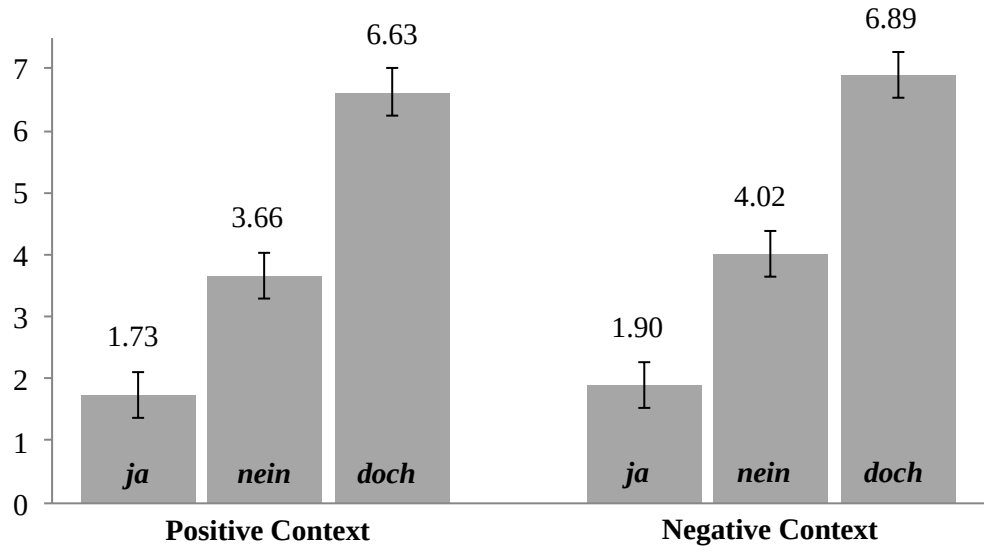


Figure 3 Mean ratings as a function of CONTEXT and RESPONSE PARTICLE in Experiment 3. Error bars represent within-subject 95% confidence intervals (Masson & Loftus 2003) associated with the particle effect in the respective context and response polarity condition. The numbers above the bars are the condition means.

[5] Model comparison yielded no better fit for a model including the RESPONSE PARTICLE-by-CONTEXT interaction ($\chi^2(2)=3.01$, $p=.22$). Comparing the final model with a model without the factor RESPONSE PARTICLE indicated a significant main effect of RESPONSE PARTICLE ($\chi^2(2)=97.13$, $p<.0001$).

As expected, the data indicate a strong preference for *doch* in rejecting responses to negative assertions. Still, a significant difference between *ja* and *nein* obtained, in terms of a preference for *nein* over *ja*, thereby replicating the finding for rejecting responses in Experiment 2. This indicates that the finding of Experiment 2 did not rest upon the absence of *doch* in the experimental situation.

Again, the preference pattern was not modulated by the context manipulation. That is, the preference pattern did not differ in the two context conditions. However, as in Experiment 2, there was a main effect of context, indicating that participants took into account the critical context information.

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 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 overall lower ratings in the 'positive context' conditions of Experiments 2 and 3 suggest that the dialogues in the 'positive context' conditions were generally 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).

(12) **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 the participants of Experiment 4 were instructed to take into account the information on the responding person's epistemological state when judging the bare-particle responses.

3.4.2 Results and Discussion

The final model for the data of Experiment 4 included the fixed factor RESPONSE PARTICLE, a by-subject random intercept, and a by-subject random slope for RESPONSE PARTICLE.[6] The final model revealed a significant effect of RESPONSE PARTICLE (b=1.67, SE= 0.48, t=3.45). As Figure 4 shows, *ja* received higher ratings than *nein*.

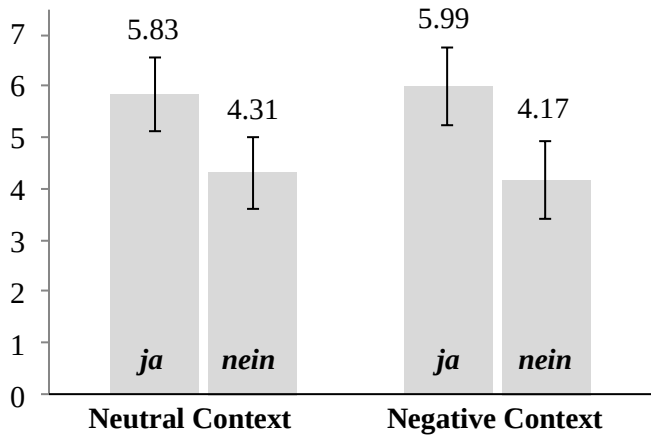


Figure 4 Mean ratings as a function of CONTEXT and RESPONSE PARTICLE in Experiment 4. Error bars represent within-subject 95% confidence intervals (Masson & Loftus 2003) associated with the particle effect in the respective context and response polarity condition. The numbers above the bars are the condition means.

[6] Model comparison yielded no better fit for a model including the RESPONSE PARTICLE-by-CONTEXT interaction ($\chi^2(2)=2.49$, $p=.29$) nor for a model including the factor CONTEXT ($\chi^2(1)=0.01$, $p=.94$).

The rating data from Experiment 4 indicate a general, context-independent preference for *ja* over *nein* in affirming responses to negative assertions. This replicates the unpredicted results 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. Moreover, it suggests that the main effect of CONTEXT in Experiments 2 and 3 was indeed due to a low coherence of the dialogues in the 'positive context' conditions.

4 General discussion

The present study investigated preference 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 strong preference for *ja* over *nein* in affirming responses and vice versa for rejecting responses. Our rating data (Experiment 1) confirmed these generally uncontroversial predictions.

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. The predictions of the saliency account are based on the particles' proposed meanings and targeted propDRs in combination with assumptions on the relative saliency of the propDRs. For rejecting responses, the feature model predicts a strong preference for *doch*, which realizes the most marked 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 p_{DR} (i.e., neutral and positive contexts) *doch*, which targets and asserts p_{DR}, is preferred over *nein*, which targets $\bar{p}_{DR}$ and asserts its negation, and *nein* is in turn preferred over *ja*, which is blocked by *doch* in targeting p_{DR}. For contexts with a salient $\bar{p}_{DR}$ (i.e., negative contexts), it predicts a preference for *nein* over *doch* over

ja. The difference between *nein* and *ja* should be larger in negative contexts, in which the targeted propDR of *nein*, $\bar{p}_{DR}$, 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 general preference for *doch* over *nein* over *ja*, without contextual modulation.

Turning to affirming responses to negative antecedents, the feature model predicts a general preference 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 preference pattern for negative contexts, where the salient propDR is $\bar{p}_{DR}$, 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) point to a general, context-independent preference for *ja* over *nein* in affirming responses to negative antecedents.

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. That is, our findings suggest that preference patterns for German particles in responses to negative antecedents are not affected by the discourse context.

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. To gain a better understanding of the unexpected preference pattern we conducted further analyses of the experimental data and investigated individual differences between the participants.

4.1 A closer look at the data: differences between participants

We conducted a closer inspection of the data for affirming responses to negative antecedents by calculating individual difference scores. More specifically, for each participant of Experiments 2 and 4, the mean rating for *nein* as an affirming response to a negative antecedent was subtracted from the mean rating for *ja*, after *z*-value transformation per participant. Thus, a positive difference score indicates a higher mean rating for *ja* compared with *nein* and a negative difference score indicates the reverse pattern. Figure 5 shows the difference scores per participant in Experiments 2 and 4.

As can be seen from Figure 5, most of the difference scores are positive, corresponding to the overall finding of a preference for *ja* over *nein* in affirming responses to negative antecedents. However, what also can be seen from the figure is that not all participants showed the overall pattern of higher ratings for *ja* than for *nein*. Some participants had negative difference scores, that is, their mean rating for *ja* was lower than their mean rating for *nein*. Thus, the participants were not homogeneous in their preference patterns. There seem to be at least two subgroups, a *ja*-group with a preference for *ja* in affirming responses to negative assertions, and a *nein*-group with a preference for *nein*.

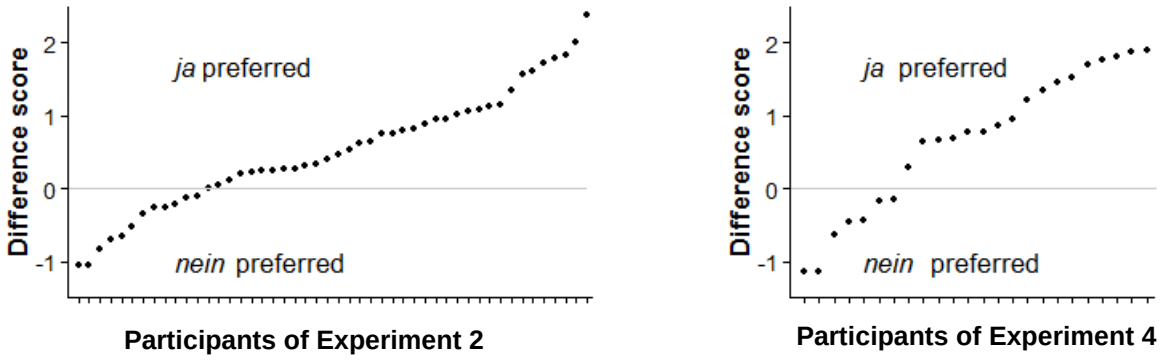


Figure 5 Difference scores per participant for affirming responses to negative antecedents in Experiment 2 (left panel) and Experiment 4 (right panel).

It is true that for some participants, the difference score was close (or equal) to zero. This may be taken as indicating the existence of a third subgroup, one without a pronounced preference for either *ja* or *nein*. However, in what follows, we will proceed with the working hypothesis that the participants fall into two distinct subgroups, a *ja*-group and a *nein*-group. Considering that the difference scores result from acceptability judgments rather than from a production task, a difference score close or equal to zero may not be indicative of a true lack of preference. 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. There is also a purely practical reason to proceed with a dichotomy rather than a trichotomy: The latter would require applying quite arbitrary cut-off points.

4.2 *Ja*-group and *nein*-group

All participants with a positive difference score (≈ 70% in Experiments 2 and 4) were assigned to the *ja*-group. All other participants were assigned to the *nein*-group (≈ 30% in Experiments 2 and 4).[7] It is noteworthy that there are no systematic differences between the *ja*-group and the *nein*-group with regard to personal data such as region (place of birth, place where they spent most of their life), age, gender, and handedness.

Figure 6 shows the mean ratings for responses to negative antecedents separately for the two groups in Experiments 2 and 4. Not surprisingly, the pattern for affirming responses differs between the two groups, pointing to a preference for *ja* in the *ja*-group, and a preference for *nein* in the *nein*-group. However, it is remarkable that the two groups also differ with regard to their ratings for *nein* as a rejecting response. It received higher ratings in the *ja*-group than in the *nein*-group. This difference was especially pronounced for bare-particle responses (see Figure 6: lower panel).

[7] We found approximately the same ratio of *ja*-group to *nein*-group (i.e. 70%/30%) in the data for the filler items of Experiment 1 and 3, i.e. filler items with affirming responses to negative assertions.

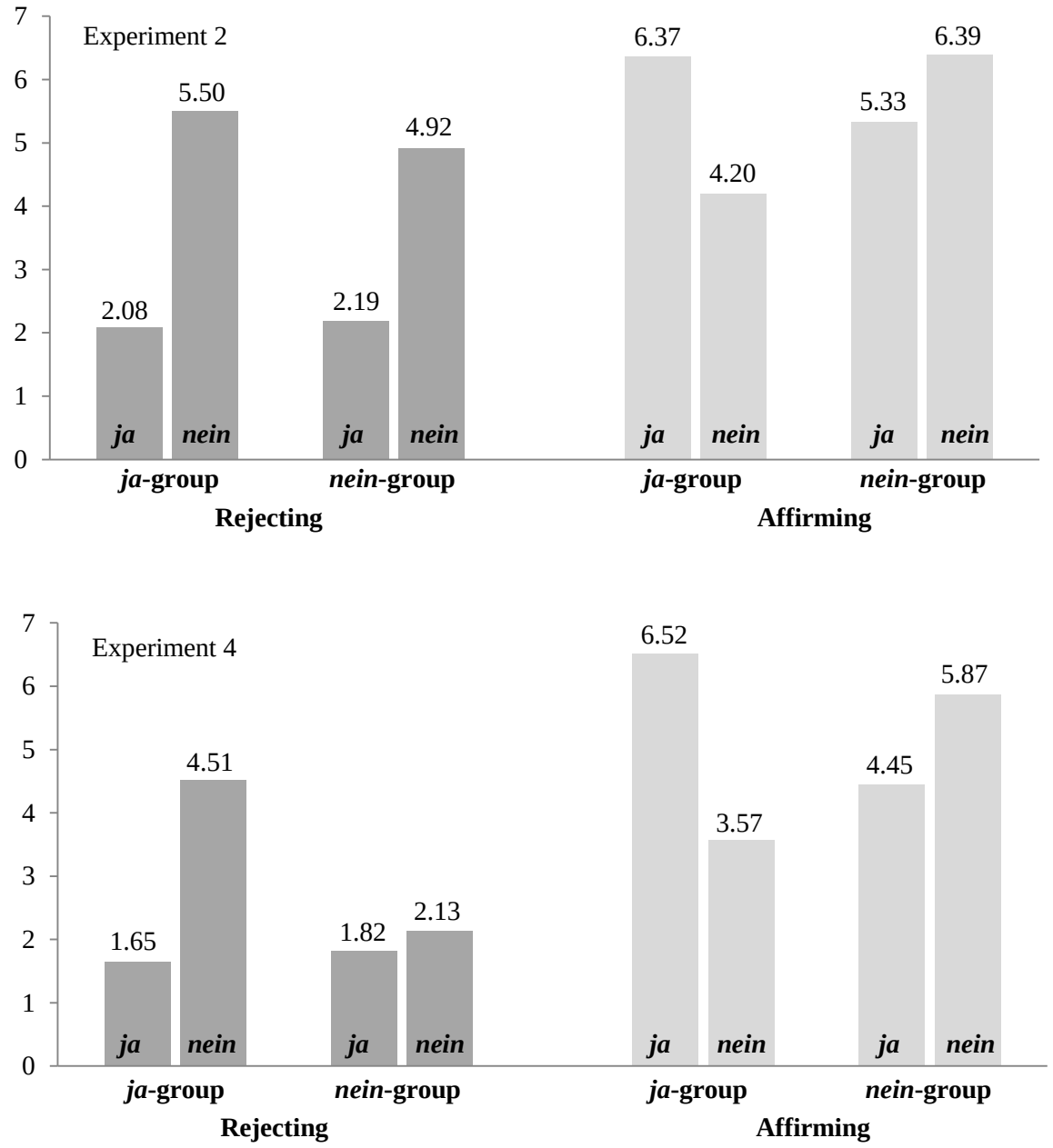


Figure 6 Mean ratings[8] of the *ja*-group and *nein*-group as a function of response type and response particle (collapsed over the two context conditions) in Experiment 2 (upper panel) and Experiment 4 (lower panel).

[8] The numbers above the bars give the mean values. We did not compute confidence intervals for the data in Figure 6 because the subgroups considerably differ in sample size.

The two groups can be placed within the cross-linguistic distinction between two different answering systems discussed in the introductory section (Pope 1976). The *ja*-group seems to apply the truth-value system with *ja* signalling the truth of the antecedent and *nein* its falsity. The *nein*-group seems to apply the polarity-based system with *nein* signalling a negative response polarity and *ja* a positive one. Recall, however, that a language with three forms, such as German (*ja, nein, doch*) can have neither a purely truth-based system nor a purely polarity-based system. The presence of *doch* introduces a second factor in both systems, that is, the response polarity in the truth-based system and the truth of the antecedent in the polarity-based system, or the antecedent polarity for both systems. In the next two subsections, we will discuss how preference patterns of the two groups can be accounted for, by considering possible revisions of the feature model and the salience account. Section 5 discusses in how far ellipsis approaches might account for the observed data patterns.

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

In the following, we discuss two potential alterations to the feature model, one of which was suggested to us by Roelofsen and Farkas (p.c.) and which assumes slightly different preference patterns with respect to the kind of features that the two groups realize. The other potential alteration assumes a change in the lexicon entries for *ja* and *nein*. Both accounts face empirical problems and cannot account for the full data set. Furthermore, there are theoretical considerations that in our view require closer scrutiny in future research.

4.3.1 Same feature realization potentials but different feature type preferences

Floris Roelofsen and Donka Farkas (p.c., December 2015) suggested to us an account of the two groups within their feature model which assumes that the two groups differ in their preferences for absolute versus relative polarity features. According to this proposal, the realization potential of *ja*, *nein*, and *doch* is the same as in the original proposal (as given in (6) above, repeated here as (13)) and does not differ between the *ja*-group and *nein*-group.

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

ja can realize [+] or [AGREE]

nein can realize [–] or [REVERSE]

doch realizes [REVERSE, +]

The two groups are assumed to differ with regard to which of the two features types they prefer to realize. The *ja*-group is assigned a preference for the relative polarity features ([AGREE] and [REVERSE]), whereas the *nein*-group is supposed to preferably realize the absolute polarity features ([+] and [–]).

For affirming responses to negative antecedents, [AGREE, –], the proposal leads to straightforward predictions. The *ja*-group should prefer *ja* over *nein*, because *ja*, but not *nein*, realizes the preferred relative polarity feature [AGREE]. In contrast, the *nein*-group is predicted to prefer *nein* over *ja*, because *nein* rather than *ja* realizes the preferred absolute polarity feature [–]. However, for rejecting responses to negative antecedents [REVERSE, +], the predictions are not clear-cut because it is not quite clear if the special status of *doch* as a dedicated particle for [REVERSE, +] responses is to be upheld or not. If only the revised feature preferences are decisive, then the *ja*-group could use *nein* or *doch*, without preferring one over the other, because both *nein* and *doch* realize the relative polarity feature [REVERSE]. The *nein*-group could use *ja* or *doch*, which both realize the absolute polarity feature [+]. If *doch* still has a special status, that is, if it is still assumed to block *ja* and *nein* in [REVERSE, +] responses, both the *ja*-group and the *nein*-group are predicted to prefer *doch* in rejecting responses to negative antecedents. If we assume that the blocking mechanism still allows for preference differences between the blocked particles, the preference pattern for the *ja*-group should then be *doch* > *nein* > *ja*, and the pattern for the *nein*-group should be *doch* > *ja* > *nein*. The data support only part of these predictions for the [REVERSE, +] responses: Although the *ja*-group did rate *nein* as a rejecting response to a negative antecedent as quite acceptable, the analogous does not hold for *ja* in the *nein*-group.

We would also like to point out that a revision in terms of a feature-type preference difference involves giving up a core assumption of the feature model: The general assumption of markedness-

related effects on response particle choice as such has to be abandoned. For instance, as outlined above, the revision implies that the *ja*-group prefers *ja* over *nein* in affirming responses to negative antecedents ([AGREE, –]). Thus, the *ja*-group prefers the particle that realizes the unmarked feature [AGREE] (*ja*) rather than the particle that realizes the marked feature [–] (*nein*), contra the markedness considerations in Roelofsen & Farkas (2015) according to which marked features have a higher realization need than unmarked features.

4.3.2 Different feature realization potentials

An alternative account of the two groups in the feature model emerges if we assume that the two groups differ in the feature realization potentials for *ja* and *nein*. According to such a proposal, *ja* and *nein* might be taken to realize only relative polarity features in the *ja*-group, and only absolute polarity features in the *nein*-group (see (14)). So in essence, the proposed preferences of *ja/nein* for a particular type of feature discussed above are part of the grammar now. The realization potential of the specialized particle *doch* is the same for the two groups: For both the *ja*-group and the *nein*-group, it realizes the feature combination [REVERSE, +].

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

***ja*-group**	***nein*-group**
ja realizes [AGREE]	*ja* realizes [+]
nein realizes [REVERSE]	*nein* realizes [–]
doch realizes [REVERSE, +]	*doch* realizes [REVERSE, +]

For affirming responses to negative antecedents ([AGREE, –]), the alternative account in terms of different realization potentials implies that the *ja*-group can only use the response particle *ja* and the *nein*-group can only use *nein*. For rejecting responses ([REVERSE, +]), the situation is similar as with the first revision because of the special status of *doch*. On the one hand, we may assume that both the *ja*-group and the *nein*-group have two response particle options: *doch* and *nein* (which realizes [REVERSE]) or *ja* (which realizes [+]), respectively. This scenario is not supported by the data. On the

other hand, we might assume, again, that *doch* blocks *nein* and *ja* respectively. Under the feature realization potentials in (14) this means that in the *ja*-group *nein* is blocked, 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, +] so is ungrammatical in such discourses. This leaves us with the preference pattern *doch* > *nein* > *ja* for the *ja*-group, and *doch* > *ja* > *nein* for the *nein*-group. Again, the predictions for the *nein*-group are not supported by the data.

A closer general inspection of the alternative account in terms of different feature realization potentials for the two groups reveals a further concern with the feature model which, however, is not specific to the present matter but rather is a general issue. A crucial requirement of the feature model is that the presuppositions of both the absolute and the relative features have to be satisfied. Hence, an answering system with only one feature type is not actually feasible in the feature model. In particular, a system solely based on absolute polarity features would be problematic. This is because the absolute polarity features only impose a presupposition on the prejacent's polarity, not on its meaning. Roughly, the prejacent must denote a proposition that is highlighted: a propDR that was introduced by a preceding utterance with either positive polarity ([+]) or negative polarity ([–]). This means that there is no restriction on the meaning of the prejacent. Consider the short dialogue in (15a) and assume the *nein*-group's realization potential of *nein*, that is, the absolute polarity feature [–].

(15) a. A: Bill raucht.
'Bill smokes.'
B: Nein. ('No.')

b. C: Jonathan raucht nicht.
'Jonathan doesn't smoke.'
A: Bill raucht.
B: Nein. ('No.')

The antecedent assertion in (15a) does not introduce a highlighted possibility with negative polarity. However, the utterance preceding the assertion may have introduced such a possibility, see (15b): C might have said that Jonathan doesn't smoke before A uttered *Bill raucht*. ('Bill smokes.'). Then, the response in (15b) may be taken to mean *No, Jonathan doesn't smoke*. This undesired result is avoided

when taking the relative polarity features into account as these features link the prejacent with the antecedent with regard to both, polarity and content. Hence, the two feature types are not independent of each other, such that a restriction of feature realization potentials to either of the two types is actually not possible in the feature model.

There are obviously other ways to revise Roelofsen & Farkas's feature model. Our discussion has shown that the matter is not entirely straightforward and that probably some further assumptions have to be made to account for the data pattern that we observed for German. Let us turn next to potential revisions of Krifka's saliency model.

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

Before discussing two possible revisions 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, $\bar{p}_{DR}$ and p_{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 both revisions of the saliency account to be considered in the next two subsections, the first two assumptions are maintained and the fourth assumption is dismissed. The two revisions differ in whether the third assumption is maintained but weakened (modified saliency account) or entirely dismissed (radical revision).

4.4.1 Modified saliency account: Different degrees of salience of $\bar{p}_{DR}$ vs. p_{DR} in the two groups

One possibility to explain the two groups in the saliency account is to assume a moderate modification, in which the two groups differ with regard to the relative saliencies of the two propDRs introduced by negative antecedents, $\bar{p}_{DR}$ and p_{DR}. Here, we discuss the option that for the *ja*-group $\bar{p}_{DR}$ is more salient than p_{DR}, whereas for the *nein*-group, the two propDRs do not differ in saliency. As for the *ja*-group, the assumption that $\bar{p}_{DR}$ is more salient than p_{DR} may be motivated by the fact that $\bar{p}_{DR}$ is

introduced by a non-embedded constituent, whereas p_{DR} is introduced by an embedded constituent. Non-embedded constituents may be more accessible than embedded constituents, as evidence from a study by Gordon, Hendrick, Ledoux & Yang (1999) suggests. However, this preference may not hold for all speakers. Our hypothesis is that the *nein*-group does not show any particular preference.[9] 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 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 $\bar{p}_{DR}$ and asserts its negation, hence it differs from *nein* by the presupposition that a negated propDR is available, and that it picks up that propDR. Note that our assumptions for the meaning of *doch* entails 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 4 and 5 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.[10] Finally, we have added a 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 violations, 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

[9] The study by Gordon et al. was concerned with complex noun phrases, for instance possessive noun phrases such as *Bill's aunt*. Reading times for clauses containing a pronoun were found to be shorter when the pronoun (*she*) referred to an entire complex noun phrase (*Bill's aunt*) than when the pronoun (*he*) referred to a component of the complex noun phrase (*Bill*) (Experiment 5; e.g. *Bill's aunt owns a lake house where she/he likes to go swimming*). This finding indicates a higher accessibility of discourse referents introduced by major constituents than of discourse referents introduced by their components. It remains to be seen whether the finding is generalizable to negation and propositional discourse referents. It also remains to be seen whether there are indeed individual differences.

[10] 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.

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.

			***Ja*-group: Salient propDR = $\bar{p}_{DR}$**					
	Particle	**Targeted propDR**	**Meaning**	***TIE**	***NON SAL**	***BLOCK**	***DOUBLE NEG**	
Positive antecedent (e.g., *Bill smokes*)	*ja*	p_{DR}	p_{DR} = affirming					☜
	nein	p_{DR}	$\neg p_{DR}$ = rejecting					☜
Negative antecedent (e.g., *Bill doesn't smoke*)	*ja*	p_{DR}	p_{DR} = rejecting		*			
		$\bar{p}_{DR}$	$\bar{p}_{DR}$ = affirming					☜
	nein	p_{DR}	$\neg p_{DR}$ = affirming		*			
		$\bar{p}_{DR}$	$\neg \bar{p}_{DR}$ = rejecting			*	*	
	doch	$\bar{p}_{DR}$	$\neg \bar{p}_{DR}$ = rejecting				*	☜

Table 4 Modified saliency account: OT tableau for the *ja*-group.

			***Nein*-group: Saliency ($\bar{p}_{DR}$) = Saliency (p_{DR})**					
	Particle	**Targeted propDR**	**Meaning**	***TIE**	***NON SAL**	***BLOCK**	***DOUBLE NEG**	
Positive antecedent (e.g., *Bill smokes*)	*ja*	p_{DR}	p_{DR} = affirming					☜
	nein	p_{DR}	$\neg p_{DR}$ = rejecting					☜
Negative antecedent (e.g., *Bill doesn't smoke*)	*ja*	p_{DR}	p_{DR} = rejecting	*				
		$\bar{p}_{DR}$	$\bar{p}_{DR}$ = affirming	*				
	nein	p_{DR}	$\neg p_{DR}$ = affirming					☜
		$\bar{p}_{DR}$	$\neg \bar{p}_{DR}$ = rejecting			*	*	
	doch	$\bar{p}_{DR}$	$\neg \bar{p}_{DR}$ = rejecting				*	☜

Table 5 Modified saliency account: OT tableau for the *nein*-group.

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 4 and 5 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* cannot target $\bar{p}_{DR}$ in either group, i.e. be used for rejections because it is blocked by *doch* as a competitor, that is, *nein* targeting $\bar{p}_{DR}$ violates the constraint *BLOCK. Recall from section 2.2 that in the present analysis *BLOCK essentially ensures adherence to the principle Maximize Presupposition. The particle *doch* is the optimal choice for the rejection of negative antecedents. 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 $\bar{p}_{DR}$ is salient, which makes both the rejecting interpretation of *ja* and the affirming interpretation of *nein* dispreferred. For the *nein*-group, the 'regular' constraints (= excepting *TIE) do not 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 $\bar{p}_{DR}$. 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 the affirming interpretation.

The modified saliency account seems to be able to explain the preference pattern for the German response particles well. Currently only the (post-hoc) finding that for rejections of negative antecedents the preference for *nein* over *ja* was larger in the *ja*-group than in the *nein*-group cannot be accounted for. We take this as a promising outcome. On the other hand, 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 mainly attributed to negation-related processing differences rather than to different response strategies.

A critical test case for the modified saliency account, which could be part of future research on the relative saliency of $\bar{p}_{DR}$ and p_{DR} depending on individual processing preferences, is the processing of propositional anaphors. Consider the dialogue in (16):

(16) 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.')

A's negative assertion introduces two propDRs: $\bar{p}_{DR}$ (¬*(steal(Tom, painting))*) and p_{DR} (*steal(Tom, 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 (16). 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 processing time and acceptability of B's second utterance is to be expected.

4.4.2 Radical revision: No saliency differences

The second possibility with respect to Krifka's (2013) saliency account is a more radical revision. It is more radical insofar as it entirely skips the assumption that $\bar{p}_{DR}$ and p_{DR} differ in relative saliency. Moreover, it does not use OT-type constraints to model the observed preference patterns and it

proposes a different semantics for the particles. However, it keeps part of the spirit of the original account by maintaining its first two main assumptions, viz. that response particles are propositional anaphors that pick up a propDR and that negative antecedents introduce two propDRs, $\bar{p}_{DR}$ and p_{DR}. The basis of the radical revision is the assumption that the *ja*-group tends to apply a truth-based response strategy whereas the *nein*-group tends to apply a polarity-based strategy. This basic assumption is implemented as a difference between the two groups as to what constitutes the targeted propDR: For the *ja*-group the response particles always pick up the discourse referent that corresponds to the proposition asserted by the antecedent. Hence, the targeted propDR is p_{DR} for positive antecedents and $\bar{p}_{DR}$ for negative antecedents. For the *nein*-group, the response particles always pick up p_{DR} irrespective of the polarity of the antecedent. Thus, the targeted propDR is p_{DR} for positive as well as for negative antecedents. We assume a slightly different semantics for the particles from the previous section, that is *ja* picks up a propDR and asserts it, *nein* picks up a propDR and asserts its negation (= as in the first revision and as in the original), but now the *nein*-group can use *ja* only with positive antecedents (which is a presupposition), and the two groups differ in their semantics for *doch*. In the *ja*-group, *doch* presupposes a negative antecedent and asserts the negation of $\bar{p}_{DR}$ (as in the first revision). In the *nein*-group, *doch* presupposes the availability of $\bar{p}_{DR}$ and picks up p_{DR} and asserts it (similar to the original proposal). Whether or not the assumption of two different *dochs* is justified is an empirical question. A revealing test would be if the two groups differ in the use and interpretation of *doch* as a response to positive antecedents (see footnote 1), which should be less frequent and less acceptable in the *ja*-group than in the *nein*-group. The implications of the radical revision for the two groups are shown for negative antecedents in Tables 6 and 7. [11] The radical revision appears to cover fairly adequately the present experimental findings, including the observation that the preference for *nein* over *ja* in rejecting responses to negative antecedents was more pronounced in the *ja*-group than in the *nein*-group.

[11] The proposal for the *nein*-group bears some resemblance to what Ginzburg & Sag (2000, p. 340) note on the opposition between German *ja* and *doch* (as well as French *oui* and *si*, and Georgian *xo* and *ki*), in that they assume similar distinct presuppositions for *ja* and *doch*. Ginzburg & Sag do not explicitly address the particle *nein*. However, they seem to equate *nein* with English *no*, for which they assume a strong tendency to interpret it as affirming in responses to negative antecedents.

Particle	Targeted propDR	Meaning	Response type	Presupposition
Positive antecedents				
ja	p_{DR}	p_{DR}	affirmation	
nein	p_{DR}	$\neg p_{DR}$	rejection	
Negative antecedents				
ja	$\bar{p}_{DR}$	$\bar{p}_{DR}$	affirmation	
nein	$\bar{p}_{DR}$	$\neg\bar{p}_{DR} \equiv p_{DR}$	rejection	
doch	$\bar{p}_{DR}$	$\neg\bar{p}_{DR} \equiv p_{DR}$	rejection	available $\bar{p}_{DR}$

Table 6 Radical revision: proposal for the *ja*-group.

Particle	Targeted propDR	Meaning	Response type	Presupposition
Positive antecedents				
ja	p_{DR}	p_{DR}	affirmation	positive antecedent
nein	p_{DR}	$\neg p_{DR}$	rejection	
Negative antecedents				
nein	p_{DR}	$\neg p_{DR}$	affirmation	
doch	p_{DR}	p_{DR}	rejection	available $\bar{p}_{DR}$

Table 7 Radical revision: proposal for the *nein*-group.

The radical revision of Krifka's (2013) account does not assume any differences between the *ja*-group and the *nein*-group with regard to negation processing in general. Thus, different from the modified saliency account (see 4.4.1), it does not imply that the two groups would differ in the processing and representation of sequences of utterances such as (16). However, the radical revision assumes that the two groups differ in their response strategies, with the *ja*-group applying a truth-based response

strategy and the *nein*-group applying a polarity-based response strategy. Preliminary support for this assumption comes from the observation that in affirming responses to negative assertions it is highly acceptable and quite common that *ja* is followed by an expression that explicitly conveys that the antecedent is true (see 17.B.i). However, combining *nein* with such an expression (see 17.B.ii) results in unacceptability except when there is a longer pause in between.

(17) A: Bill raucht nicht. ('Bill doesn't smoke.')

B: i. Ja, stimmt. ('Yes, that's true.')

ii. #Nein, stimmt. ('No, that's true.')

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 Swedish and English by Holmberg (2013). 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. 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 in relation to our experimental findings. At the end of the section we will sketch an alternative ellipsis account, which avoids some of the problems encountered in those discussed before, but which also leaves some questions open.

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 ∅, 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 evidenced for instance by their occurrence below conditional *if*

(*wenn ja*…, *wenn nein*…), which in English is not possible (**if yes*…, **if no*) (Krifka 2013; but see Textor 2011 for a different view). 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 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.[12] 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 feature that is interpretable is the one that is lowest in the clause provided that this does not violate the semantic identity condition. Consider (18) and (19), which are two dialogues with declarative antecedents that are modelled on dialogues with interrogative antecedents in Kramer & Rawlins (2010). In (18), 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 (19), 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.

[12] The features here are formal syntactic features and can be uninterpretable or interpretable, that is they are different from the features in Roelofsen & Farkas.

(18) a. A: Alfonso is not coming to the party.

B: No. (= He is not coming to the party.)

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

(19) a. A: Alfonso is coming to the party.

B: No. (= He is not coming to the party.)

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

The assumption that *no* always has an *un*interpretable 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 ΣP (in the case of positive antecedents). This view of *no* is reminiscent of the presuppositional meaning of the absolute polarity features of Roelofsen & Farkas (2015), which required the TP complement of the Pol head they appeared on to be positive [+] or negative [–]. When *no* realizes [–] it indicates that the prejacent contains a negation. The positive polarity feature [+] of Roelofsen of Farkas, however, finds no direct counterpart in Kramer & Rawlins (2010): *yes* has no polarity feature, and the Σ head in positive clauses does neither. So essentially the meaning of a bare *yes* response is that of the antecedent clause, see (20).

(20) a. A: Alfonso is not coming to the party.

B: Yes. (= He is not coming to the party.)

b. $[_{\Sigma P}\ yes\ [_{\Sigma P}\ \Sigma_{[E]}\ [_{TP}\ he\ [_{NegP}\ NEG_{\mathbf{[iNeg]}}\ [is\ coming\ to\ the\ party]]]]]$

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 νP). Note that this suggestion does not apply to rejecting responses to positive antecedents like (19).

In the following we will explore the potential of Kramer & Rawlins's (2010) proposal to account for our experimental findings.[13] We suggested above that German *ja* and *nein* are best analysed as Σ heads in Kramer & Rawlins's account. Being a Σ 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 νP adjunct in German. (21) 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.

(21) a. A: Bill raucht nicht. ('Bill does not smoke.')
B: Nein. (= 'Bill does not smoke.')

b. $[_{\Sigma P}$ nein$_{[\mathbf{uNeg}, E]}$ $[_{TP}$ $[_{\nu P}$ NEG$_{\mathbf{[iNeg]}}$$[_{\nu P}$ Bill raucht]]]]

It is revealing to compare (21) to a *nein*-answer as a response to a positive antecedent, see (22). We see that in (22), *nein* has an interpretable feature. The reason for this difference is simply that in (21) the elided TP must contain an interpretable negation because of the negative antecedent, whereas in (22) it must not. So, the assumption for English, viz., that *nein* has a constant feature set-up, does not carry over to 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.

[13] 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).

(22) a. A: Bill raucht. (‘Bill smokes.’)

B: Nein. (= ‘Bill does not smoke.’)

b. [$_{\Sigma P}$ nein $_{[\mathbf{iNeg}, E]}$ [$_{TP}$ [$_{vP}$ NEG$_{\mathbf{[uNeg]}}$[$_{vP}$ Bill raucht]]]

Turning to the *ja*- group, the syntax of affirming responses to negative antecedents is straightforward:

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

B: Ja. (= ‘Bill doesn’t smoke.’)

b. [$_{\Sigma P}$ ja$_{[E]}$ [$_{TP}$ [$_{vP}$ NEG$_{\mathbf{[iNeg]}}$[$_{vP}$ Bill raucht]]]]

The more interesting question is why the *nein*-group disprefers *ja* and why the *ja*-group disprefers *nein* in affirming responses to negative assertions. Starting with the *ja*-group we must assume that the analysis in (21) 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 (21), which is not the intended meaning. Such an analysis is supported by our finding that the *ja*-group accepts *nein* as a reversing answer to a negative antecedent better than the *nein*-group does, see (24) for the corresponding analysis.

(24) a. A: Bill raucht nicht. (‘Bill does not smoke.’)

B: Nein. (= ‘Bill smokes.’)

b. [$_{\Sigma P}$ nein $_{[\mathbf{iNeg}, E]}$ [$_{TP}$ [$_{vP}$ NEG$_{\mathbf{[iNeg]}}$[$_{vP}$ Bill raucht]]]]

In a way then, the *ja*-group would be more consistent than the *nein*-group in the featural characteristics of *nein*: *nein* always has an interpretable NEG feature.

The observation that the *nein*-group disprefers *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 part of the data but its coverage is smaller than that of the anaphor accounts.

5.2 Holmberg (2013)

Holmberg's account is fairly similar to Kramer & Rawlins's with respect to the main syntactic assumptions but takes a rather different view on the issue of negative neutralization. Like Kramer & Rawlins, Holmberg assumes that there is a polarity phrase whose head (Pol = Σ) takes the TP as complement (cf. Holmberg 2001, 2007). The Pol head has a negative or a positive polarity feature in assertions, and an unvalued polarity feature in polarity questions. The response particles *yes* and *no* do not occur in or adjoined to PolP as in Kramer & Rawlins (2010) but they are focussed operators occurring in the specifier of a higher Foc(us)P. It is the PolP that is elided in bare particle responses, which is subject to LF-identity with an antecedent, that is, the identity condition is stricter than in Kramer & Rawlins.

The response particles in Spec,FocP carry the polarity features *affirmative* and *negative*, respectively, and form an operator-variable structure with the Pol head. The particle *no* comes in two versions. In answers to positive questions, it has an interpretable NEG feature, which is assigned to an unvalued Pol head, see (25). In answers to negative polar questions with an inner negation reading,

which already come with a *negative* Pol head, *no* has an uninterpretable NEG feature forming a concord chain with *negative* Pol, see (26)[14]:

(25) A: Does he drink coffee?

B: [$_{FocP}$ no $_{[iNEG]}$ [$_{PolP}$ he [$_{Pol'}$ doesn't$_{[NEG]}$ [$_{TP}$ <he> drink coffee]]]]

(26) A: Does he not drink coffee?

B: [$_{FocP}$ no $_{[uNEG]}$ [$_{PolP}$ he [$_{Pol'}$ doesn't$_{[iNEG]}$ [$_{TP}$ <he> drink coffee]]]]

We assume that the structure in (26) is also the structure of responses to negative assertions. Holmberg suggests that the version of *no* with an uninterpretable NEG feature is only available in polarity-based languages – which allow negative concord (there is no double negation reading). Note, however, that his proposal cannot capture *no*-responses to positive assertions like (27). These should be unacceptable because PolP has a positively valued feature due to the syntactic identity condition, and that feature clashes with the *negative* feature on *no*. So there is an important gap in the account.

(27) a. A: He drinks coffee.

B: No. (= He doesn't drink coffee.)

b. [$_{FocP}$ no $_{[iNEG]}$ [$_{PolP}$ he Pol$_{[Aff]}$ [$_{TP}$ <he> drinks coffee]]]

We mentioned above that Holmberg takes a different view on negative neutralization, that is, the observation that both *yes* and *no* are felicitous to affirm a negative question/assertion. He does this by taking a closer look at the response strategies used in reaction to questions containing another operator above the negation, for example, *sometimes* in (28)(a) below. We briefly commented on such cases in the introductory section (see the discussion below example (4)), and observed that the preferences for such sentences are like those for positive antecedents, that is, the negative neutralization effect disappears (cf. Brasoveanu et al. 2013 for experimental evidence on English).

[14] Holmberg is not so clear about the valuation of Pol in negative polar questions. On the one hand they should have unvalued Pol (p. 36) but on the other hand they seem to come with *negative* Pol (p. 38-9).

Now, Holmberg argues that the negation in sentences like (28)(a) is in a lower syntactic position, adjoined to vP, see (28)(b). Evidence for the existence of a different syntactic position from ordinary negation comes from the observation that low negation can co-occur with ordinary negation, as in *Luckily John hasn't not done his homework*. In replies like (28), B's affirmative *yes* forms an operator-variable structure with the *affirmative* Pol head. The negation is low in the elided clause. The structure is grammatical. *No* cannot form a corresponding operator-variable structure because of a feature clash, neither can it form a negative concord chain with the lower negation because the adverb blocks this chain.

(28) a. A: Is John sometimes not coming to work?

B: Yes. (= John is sometimes not coming to work.)

b.[$_{FocP}$ yes $_{[Aff]}$ [$_{PolP}$ John Pol$_{[Aff]}$ [$_{TP}$ <John> sometimes is [$_{vP}$ not$_{[Neg]}$ [$_{vP}$ coming to work]]]]]

Holmberg further points out that negative sentences without an additional operator are ambiguous between having ordinary[15] or lower negation, and maintains that this ambiguity leads to variable judgements such that some speakers in some contexts will accept *yes* as an affirming response even in the absence of another operator. Thus negative neutralization in his view is due to an ambiguity such that affirming *no*-answers affirm sentences with an ordinary negation (via negative concord), and affirming *yes*-answers affirm sentences with a low negation.[16] The experimental findings for English that *no*-responses are preferred in affirming response to sentences with clausal negation but without additional operators (Brasoveanu et al. 2013; Goodhue et al. 2013; Goodhue & Wagner 2015), would then be due to a preference to interpret the negation as ordinary rather than as low negation.

Holmberg's explanation of negative neutralization at first sight seems to open up a new perspective on our experimental findings for German, especially the two speaker groups. It is plausible

[15] Holmberg actually calls what we call 'ordinary' negation 'middle negation'. 'High' negation is then the negation in high negation reading questions (Ladd 1981).

[16] We are presenting an intermediate step in the argumentation in Holmberg (2013). After consideration of Swedish, Holmberg changes his proposal slightly and assumes a NegP below PolP, which hosts ordinary negation and which matches in its features with PolP (also see the main text further below). The presence of an operator like *sometimes* between Pol and Neg blocks the feature matching operation. This new version of the account can no longer explain the neutralization effect in the absence of the additional operator in English. So, to keep the basic idea of different syntactic positions of the negation, we stay with Holmberg's intermediate step.

to assume that the *ja*-group speakers interpret the negation in the antecedent as 'low' negation whereas the *nein*-group speakers interpret it as 'ordinary' negation. However, it is important to note that 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 (as is also assumed by Holmberg 2013, also cf. Repp 2009 for discussion). So in German ordinary negation is fairly low and it seems difficult to explain the data in terms of higher vs. lower negation.[17,18] There also remains the problem mentioned earlier that *no*-responses to positive antecedents are not captured in Holmberg's account, which carries over to German. Holmberg does make a suggestion for the Swedish equivalent of German *doch*, *jo*, which is used to reject a negative antecedent. He proposes that *jo* operates on the polarity chain, that is essentially the Pol head, and changes its value from NEG to positive. We must assume that the identity condition is applied before this operation.

Overall it seems that despite some partial successes the existing ellipsis accounts face considerable difficulties in accounting for the German data. They would require some serious re-working. In the next subsection we sketch a somewhat simpler ellipsis account, which can explain the German data but which comes with the price that the *nein*-group has two different *nein*s. 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 seems unavoidable in an ellipsis account – both Kramer & Rawlins and Holmberg have integrated such assumptions in their proposals.

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[17] To be sure, 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 not done her homework.'

[18] Holmberg discusses a similar issue for Swedish whose negative marker *inte* also occurs low in the clause, above vP. Holmberg suggests that Swedish like English has a PolP high up in the TP domain, which is silent and receives its value from the negation lower in the clause if there is such a negation and otherwise has the default value *affirmative*. Response particles still are in an operator-variable relation with Pol. Thus, in a *no*-response, Pol is negative, which means that there must be a negation lower in the clause and consequently in the antecedent. In a *yes*-response, Pol is positive, and there must not be a negation in the antecedent. This set-up matches the response strategies in Swedish, where affirming *yes*-answers to negative questions are not allowed. Swedish is a 'robust' polarity-based system, as Holmberg suggests. However, our experimental findings for responses to assertions in German are not compatible with this suggestion: a majority of speakers (the *ja*-group) uses the affirmative particle in the presence of negation.

5.3 An alternative ellipsis account

Although German main clauses are CPs we assume in our explorative alternative ellipsis account that *ja, nein* and *doch* are operators on the TP so as to exclude sentence type information from the operation domain of the particles. In the alternative ellipsis account, the TP is a syntactic copy of its antecedent and is obligatorily elided. It can be followed by a CP which expresses the same meaning, as in *Ja, ~~Bill raucht~~. Bill raucht.* ('Yes. ~~Bill smokes.~~ Bill smokes.') The particles take the proposition denoted by the TP as argument, see (29) for their semantics. The meanings of *ja* and *doch* are the same in the two speaker groups: *ja* delivers the proposition denoted by the TP without changing anything. *doch* presupposes that the proposition denoted by the TP is negative (which can be implemented in a syntactic feature chain, see (30)(b) for an illustration with *nein*), and reverses the polarity of that proposition. The meaning of *nein* differs in the two groups: the *ja*-group has one *nein*, which reverses the polarity of the proposition denoted by the TP, the *nein*-group in addition has a *nein* that does not reverse the polarity but which comes with the presupposition that the TP is negative, which again can be implemented as a syntactic feature chain.

(29)

ja-group	*nein*-group
⟦ja⟧ = λp.p	⟦ja⟧ = λp.p
⟦nein⟧ = λp.¬p	⟦nein_1⟧ = λp.¬p
	⟦nein_2⟧ = λp: 'p has negative polarity'.p
⟦doch⟧ = λp: 'p has negative polarity'.¬p	⟦doch⟧ = λp: 'p has negative polarity'.¬p

(30) a. A: Bill raucht nicht. ('Bill does not smoke.')

B: Nein. (= 'Bill doesn't smoke.')

b. $[\text{nein}_{2\ [\mathbf{uNeg},\ E]}\ [_{TP}\ [_{vP}\ \text{NEG}_{\mathbf{[iNeg]}}[_{vP}\ \text{Bill raucht}]]]]$

Tables 8 and 9 show that these assumptions can account for the data pattern observed in our experimental studies, except for the observation that the preference for *nein* over *ja* was larger in the *ja*-group than in the *nein*-group in rejecting responses to negative antecedents. Focussing on the

responses to negative antecedents we see in Table 8 that the *ja*-group prefers *ja* as an affirming response, and *doch* over *nein* over *ja* as a rejecting response; Table 9 shows that the *nein*-group prefers $nein_2$ as an affirming response, and *doch* over $nein_1$ over *ja* as a rejecting response. This seems to be a favourable outcome but note that except from the one empirical problem there remains the potentially problematic – because otherwise unmotivated – assumption that the *nein*-group uses two different *neins*. Future research must show if that is an assumption that needs to be made or if the revisions of the anaphoric accounts are better suited to explain the response particle patterns found cross-linguistically.

Antecedent = TP of elided clause	**Response type**	**Meaning of response**	**Particle choice**	**Comment**
p	affirming	p	*ja*	only *ja* expresses intended meaning
	rejecting	¬p	*nein*	*nein* and *doch* express intended meaning, *doch*'s presupposition is not met
¬p	affirming	¬p	*ja*	only *ja* expresses intended meaning
	rejecting	p	*doch*	*doch* and *nein* express intended meaning, Maximize Presupposition ⇒ *doch*

Table 8 Particle preferences for the *ja*-group according to the alternative ellipsis model.

Antecedent = TP of elided clause	**Response type**	**Meaning of response**	**Particle choice**	**Comment**
p	affirming	p	*ja*	only *ja* expresses intended meaning
	rejecting	¬p	$nein_1$	$nein_1$ and *doch* express intended meaning, *doch*'s presupposition is not met
¬p	affirming	¬p	$nein_2$	*ja* and $nein_2$ expresses intended meaning, Maximize Presupposition ⇒ $nein_2$
	rejecting	p	*doch*	*doch* and $nein_1$ express intended meaning, Maximize Presupposition ⇒ *doch*

Table 9 Particle preferences for the *nein*-group according to the alternative ellipsis model.

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' (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. The data suggests that there are (at least) two groups of speakers, differing in their preference patterns for *ja* and *nein* in 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. 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 preference patterns 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 highlighted 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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