The German particle *denn* in a Scoreboard model of discourse[1]

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Abstract. We develop a Scoreboard-based analysis of the German discourse particle *denn* occurring in questions. There are three main outcomes of this exercise: First, we propose that the function of *denn* naturally fits the central ideas of the Scoreboard model: *denn* indicates that acceptance of the previous discourse move (which may be implicit) is being put on hold until some issue arising from it has been clarified. Second, we show that the formal implementation requires treating all components of a context structure as stacks rather than sets. Third, we argue that the notion of highlighting, which had a prominent place in a previous analysis, is not needed to capture the meaning and distribution of *denn*.

Keywords: discourse particles, Scoreboard model, highlighting.

1. Introduction

In its use as discourse particle, German *denn* mainly occurs in questions (König, 1977; Thurmair, 1989, 1991; Kwon, 2005; Csipak and Zobel 2014). To see some examples, *denn* is acceptable in polar questions like (1a) and *wh*-questions like (1b), but unacceptable in declarative and imperative clauses, as in (1c)-(1d):

(1) a. Hast du denn ein Auto? — POLAR QUESTION
Do you DENN have a car?
b. Wo wohnst du denn? — WH-QUESTION
Where do you DENN live?
c. *Ich habe denn ein Auto. — DECLARATIVE
I DENN have a car.
d. *Komm denn her! — IMPERATIVE
Come DENN here!

Theiler (2021) proposes an account of *denn* in terms of Conventional Implicatures (CIs):[2]

(2) Theiler's Felicity condition of *denn* (simplified):
Denn is felicitous in a question Q iff the speaker S requires a positive answer to Q in order to proceed in the discourse.

Theiler distinguishes five cases, which differ regarding what exactly 'proceeding in discourse' comes down to.

In cases 1, 2 and 3, in order to proceed in discourse, an interlocutor has to **(i)** accept the felicity conditions of the preceding speech act, and **(ii)** carry out the instruction imparted by the respective speech act – integrate the information in the case of an assertion (case 3), give an answer in the case of a question (case 2) and execute the command in the case of an imperative (case 1). Accordingly, *denn* can be used by a speaker S to signal **(i)** that S has doubts about the

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[2]For the time being, this simplified version of Theiler's analysis will do. The more detailed version is postponed until section 4.1.

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felicity of the preceding speech act, as illustrated in (3b) for a preceding question, or **(ii)** that S needs more information to integrate the information / give an answer / execute the command, as shown in (3c) for the same preceding question:

(3) a. Do you have a steady boyfriend?
b. S: Was geht dich das denn an?
What's that DENN to you?
c. S: Was verstehst du denn unter einem 'festen Freund'?
How would you DENN define 'steady boyfriend'?

In Theiler's cases 4 and 5, a *denn*-Q does not react to an explicit previous discourse move by the addressee A. Central to case 4, illustrated in (4), is that S transparently entertains the plan to perform an action. To proceed, S has to carry out this plan.

(4) [S picks up A at his office to go to a talk as previously arranged.]
S: In welchen Raum findet der Vortrag denn statt?
In which room does the talk DENN take place?

In case 5, illustrated in (5), the *denn*-Q is uttered in reaction to a salient piece of contextual information. To proceed, S has to accept this information.

(5) [S and A are walking by a lake that usually doesn't freeze. S notices that the lake is frozen.]
S: Schau mal! War es denn diesen Winter kälter als normal? (Theiler, 2021: ex. (27))
Look! Was this winter DENN colder than usual?

The goal of the present paper is two-fold. First, building on and modifying Theiler (2021), we develop a Scoreboard-based analysis of *denn* that explicates Theiler's notions of "proceeding in discourse" and of "needing an answer to the *denn*-Q in order to proceed" in Scoreboard and Gricean terms. While Theiler anticipates that a Scoreboard rendition can be done for the first three cases, she is skeptical about the latter two cases, where a *denn*-Q does not react to an explicit previous discourse move. We show that this can be done in a unified way for all five cases if certain assumptions are made about elements represented in the context structure and the way update works. Second, we argue that certain conditions in Theiler's original account – in particular, the need for a *positive* answer to the *denn*-Q– should not be built into the analysis of *denn* but rather depend on the intended mother-daughter relation in the salient Question-Under-Discussion (QUD) structure. Taken together, the two contributions of this paper reduce the effects of Theiler's CI condition (2) to Scoreboard concepts and general principles of discourse organization.

The rest of the paper is organized as follows. Section 2 introduces the Scoreboard model of discourse, including the original ingredients from Farkas and Bruce (2010) and extensions motivated in the literature as well as modifications motivated by our analysis of *denn*. Section 3 tackles the first objective: An update function is defined for a *denn*-Q within the Scoreboard model, it is applied to cases 1, 2 and 3 and, after proposing how non-verbalized but mutually evident information/goals are incorporated into the discourse, it is shown to derive cases 4 and 5 as well. Section 4 turns to the second objective: We show that Theiler's requirement for a *positive* answer to the *denn*-Q is too strong and tentatively argue that, in Theiler's original examples, the apparent need for a positive answer independently follows from current analyses of

the well-known asymmetry of polar questions, (e.g. in Bolinger's (1978) extended paradigm). Section 5 concludes.

2. Extended Scoreboard model

The Scoreboard model of discourse represents discourse as a sequence of context structures c hosting various components that are operated on as discourse proceeds. Several components have been argued for in the literature. Farkas and Bruce (2010) assume that a context structure c consists of the Common Ground cg (a set of propositions summarizing the information shared by the interlocutors) and Q (a stack of questions to be addressed). (We leave their discourse commitments aside.) Portner (2004) adds a To-do List (*TdL*) for each interlocutor (a set of propositions reflecting the publicly acquired obligations of each interlocutor). For each component, an actual and a projected version, represented here with *, have been proposed in the literature (see Farkas and Bruce, 2010 for cg*; Biezma and Rawlins, 2017 for Q*; Rudin, 2018 for *TdL**). Putting it all together, this gives us context structures with the general form shown in Figure 1.

actual			projected		
What participants mutually accept	Participants' conversational goals	Participants' tasks			
cg_i	Q_i	TdL_{Ai}, TdL_{Bi}	cg^*_i	Q^*_i	TdL^*_{Ai}, TdL^*_{Bi}

Figure 1: Context structure c_i.

Building on this view of context structures, we propose an important modification: Just like $Q^{(*)}$ is a *stack* of questions –i.e., a tuple– and not just an unordered set, so are $cg^{(*)}$ and $TdL^{(*)}$ stacks of propositions and not simply sets thereof. As we will see below, in order to properly account for *denn*-Qs and subsequent acceptance moves, we need to access not just the c_o output of the last move but a longer "history" of pending update proposals, which we model using stacks for the relevant components of c. In other words, using *denn*-Qs as a window onto the inner workings of discourse structures, we argue that the additional expressive power conferred by using stacks instead of sets is needed not just for $Q^{(*)}$ but also for $cg^{(*)}$ and $TdL^{(*)}$.[3]

The Scoreboard model registers the effects of discourse moves, including assertions, questions and imperatives. An assertion is a proposal to update the cg, a question is a proposal to update the Q-stack, and an imperative is a proposal to update the addressee's *TdL*. The respective operations are defined in (6):

(6) a. $c_i + \ulcorner \text{ASSERTION}(\phi) \urcorner = \langle cg_i, Q_i, TdL_i, \text{push}([\![\, \phi \,]\!], cg^*_i), Q^*_i, TdL^*_i \rangle$
b. $c_i + \ulcorner \text{QUESTION}(\phi) \urcorner = \langle cg_i, Q_i, TdL_i, cg^*_i, \text{push}([\![\, \phi \,]\!], Q^*_i), TdL^*_i \rangle$
c. $c_i + \ulcorner \text{IMPERATIVE}(\phi) \urcorner = \langle cg_i, Q_i, TdL_i, cg^*_i, Q^*_i, \text{push}([\![\, \phi \,]\!], TdL^*_{Ai}) \rangle$

A proposed update becomes an actual update after it has been accepted by the interlocutor(s). In contrast to e.g. Biezma and Rawlins (2017), in our implementation acceptance is not wholesale. What gets accepted is always the proposal corresponding to the immediate previous move

[3]Using stacks instead of sets has also some intuitive appeal. Similar to a hierarchically organized QUD structure $Q^{(*)}$ tracking questions and sub-questions to be resolved, a $TdL^{(*)}$ can be conceived as a hierarchical structure of goals and subgoals to be carried out. The stack treatment can be generalized to encompass $cg^{(*)}$ as well to account for phenomena like discourse deixis (e.g. *the former... the latter* in Levinson, 1983).

(that is still pending). This will be crucial when considering interleaved discourse moves such as *denn*-Qs. Acceptance of the previous move corresponds to the following steps: taking the content that was last added to a projected component (= top(X^*)), adding it to the corresponding actual component (= push(top(X^*),X) and removing it from the projected component (= pop(X^*)). This is defined in (7).

(7) a. $c_i + \ulcorner \text{ASSERTION-ACCEPT} \urcorner = \langle \text{push}(\text{top}(cg_i^*), cg_i), Q_i, TdL_i, \text{pop}(cg_i^*), Q_i^*, TdL_i^* \rangle$
b. $c_i + \ulcorner \text{QUESTION-ACCEPT} \urcorner = \langle cg_i, \text{push}(\text{top}(Q_i^*), Q_i), TdL_i, cg_i^*, \text{pop}(Q_i^*), TdL_i^* \rangle$
c. $c_i + \ulcorner \text{IMPERATIVE-ACCEPT} \urcorner = \langle cg_i, Q_i, \text{push}(\text{top}(TdL_i^*), TdL_i), cg_i^*, Q_i^*, \text{pop}(TdL_i^*) \rangle$

Note that we assume –unlike Farkas and Bruce (2010) and like Biezma and Rawlins (2017)– that content that is transferred from a projected component to the corresponding actual component is then removed from the projected component. This means that often times projected components are completely empty. The role of the projected components differs in these two approaches. On the one hand, Farkas and Bruce (2010) make crucial use of cg^* to determine future possible developments of the Common Ground and thus to steer the direction of the conversation (similar to Krifka's (2105) commitment states); their cg^* is never empty. On the other, Biezma and Rawlins (2017) use Q^* to keep track of questions that are awaiting being added to the actual Q-stack; their Q^* is empty when nothing is pending. As *denn*-Qs crucially involve pending update proposals, we follow Biezma and Rawlins' (2017) conceptualization and extend it to all projected components, i.e. cg^*, Q^* and TdL^*.

An example of an update by an assertion followed by acceptance is shown in Figure 2.

	actual			projected		
c_1:	cg_1	Q_1	TdL_{A1}, TdL_{B1}			
A: *It is raining.* (=p)						
c_2:	cg_1	Q_1	TdL_{A1}, TdL_{B1}	push($p, \langle\rangle$)		
ASSERTION-ACCEPT						
c_3:	push(p, cg_1)	Q_1	TdL_{A1}, TdL_{B1}			

Figure 2: Example assertion update plus acceptance.

We propose that proposals to update *cg/Q/TdL* are triggered not just by the corresponding explicit discourse moves but also by e.g. non-verbal evidence. The difference between a proposal to update *cg/Q/TdL* and an actual update of *cg/Q/TdL* will be crucial for the analysis of *denn*-Qs in the Scoreboard model.

3. Analysis of *denn*-Qs in the extended Scoreboard model

3.1. The discourse contribution of *denn*-Qs

Denn-Qs include (at least) two classes of non-canonical discourse moves discussed in the literature: resistance moves in the sense of Bledin and Rawlins (2020) and clarification requests in the sense of Ginzburg (2012). On the one hand, a resistance move "postpones the resister's acceptance or rejection of a prior proposal, raising some new subject matter that bears in some way on this proposal" (Bledin and Rawlins 2020: 47). Additionally, "after the resistance move, the original speaker must reconsider her initial move" (ibid.: 45). An example is (8), where S resists A's assertion and brings to A's attention other considerations that may make her revisit

her original move. *Denn*-Qs can be used as resistance moves in this sense, as illustrated in (9):

(8) A: Alfonso bought a new Ferrari.
S: {How do you know?/Really?} Did you see it?

(9) A: ⟨arbitrary assertion⟩ (Theiler, 2021: ex. (21))
B: Weißt du das denn auch sicher?
Do you DENN know this for sure?

On the other hand, clarification requests, while still indicating that the original proposal is pending, typically do not aim at making the original speaker reconsider her move, but rather request further information that will assist the current speaker in accepting the original proposal. An example is given in (10). *Denn*-Qs can be used as clarification moves as well, as in (11):

(10) A: Maggie is coming to the pub.
S: Maggie who?

(11) [Two Annas: A and S know exactly two people called Anna. One of them lives in Munich, the other one in Berlin. This is commonly known among A and S.]
A: Earlier today, Anna called.
S: Welche Anna meinst du denn? (Theiler, 2021: ex. (4))
Which Anna do you DENN mean?

We propose that what these two uses have in common is their placement in the dynamics of the Scoreboard model: A *denn*-Q –both in its resistance use and in its clarification use– is an intermediate move between a proposal to update and the (intended) actual update (cf. Bledins and Rawlins, 2020: 49). In other words, by uttering a *denn*-Q, a speaker stops the projected context from becoming the actual context and interleaves a new question that is relevant –i.e., stands in a tight QUD relation– to the previous utterance and needs to be dealt with first. We define the discourse update function of a *denn*-Q in (12):

(12) a. $c_i + \ulcorner \text{QUESTION}(\textit{denn}\ \phi) \urcorner = c_i + \ulcorner \text{QUESTION}(\phi) \urcorner$
b. Felicity constraint:
(i) $cg_i^* \neq \langle\rangle$, or
(ii) $Q_i^* \neq \langle\rangle$, or
(iii) $TdL_i^* \neq \langle\rangle$

To see how this definition derives the desired effects, consider the example discourse in (13) and the corresponding Scoreboard stages in Figure 3:

(13) A: It is snowing.
S: Ist es denn so kalt?
Is it DENN that cold?
A: It is -2 degrees.

The felicity constraint (12b) requires that there still be material in some projected component (the projected cg^* of c_2 in Figure 3). Thus, *denn* explicitly signals that S has not accepted the previous discourse move, i.e., that the corresponding update proposal has not become an actual update. This is particularly useful as acceptance moves can also be implicit. Additionally, from S inserting a question move between the proposed and the actual update of the previous

	actual			projected		
c_1:	cg_1	Q_1	TdL_{A1}, TdL_{S1}			
					A: *It is snowing.* (=p)	
c_2:	cg_1	Q_1	TdL_{A1}, TdL_{S1}	push($p, \langle\rangle$)		
					S: *Is it* DENN *that cold?* (=$\{q, \neg q\}$)	
c_3:	cg_1	Q_1	TdL_{A1}, TdL_{S1}	push($p, \langle\rangle$)	push($\{q, \neg q\}, \langle\rangle$)	
					QUESTION-ACCEPT	
c_4:	cg_1	push($\{q, \neg q\}, Q_1$)	TdL_{A1}, TdL_{S1}	push($p, \langle\rangle$)		
					A: *It is -2 degrees.* (=r)	
c_5:	cg_1	push($\{q, \neg q\}, Q_1$)	TdL_{A1}, TdL_{S1}	push(r,push($p, \langle\rangle$))		
					ASSERTION-ACCEPT	
c_6:	push(r, cg_1)	push($\{q, \neg q\}, Q_1$)	TdL_{A1}, TdL_{S1}	push($p, \langle\rangle$)		
					QUD-CLEARING	
c_7:	push(r, cg_1)	Q_1	TdL_{A1}, TdL_{S1}	push($p, \langle\rangle$)		
					ASSERTION-ACCEPT	
c_8:	push(p,push(r, cg_1))	Q_1	TdL_{A1}, TdL_{S1}			

Figure 3: Example context update with *denn*-Q.

move –in our example, between c_2 and c_8–, A will infer via the Gricean principle of Relation that the inserted question is relevant to decide the fate of the previous move, i.e., to decide on its transition from proposed to actual update (cf. Bledins and Rawlins, 2020: 72). Hence the overall intuitive empirical effect: A *denn*-Q raises a novel issue that is relevant to the previous move, which is still pending and awaiting acceptance (cf. discourse dependence of *denn* in König, 1977; Thurmair, 1991; Bayer, 2012). After the question introduced by the *denn*-Q has been answered, i.e. if it is completely resolved by cg, it will automatically be cleared from the Q-stack via a 'maintenance' move we call QUD-CLEARING (cf. Biezma and Rawlins, 2017), see c_7. If the new information is sufficient to clear her reservations, S can return to A's original assertion that is still pending and finally accept it, see c_8.

Figure 3 also makes clear why cg^* has to be a stack of propositions and cannot simply be a set thereof. Consider what happens after A's second assertion *It is -2 degrees.* We have to make sure that, by accepting this assertion (in step c_6) S does not simultaneously accept A's original assertion *It is snowing*. In other words, acceptance only targets the most recent proposed update. If new propositions were just added by merging them into a set of propositions, it would be impossible to retrieve the proposition that was added last.[4]

[4]In step c_6 of Figure 3 it would actually be possible to recover the proposition that was added last even if cg^* was modelled as a set of propositions. What one would have to do is compute the difference between cg^*_5 and cg^*_6. But simply considering the difference to the move immediately above isn't always enough. As *denn*-Qs can be embedded at arbitrary depth, one would need access to the entire history. Importantly, *denn*-Qs can be stacked in the sense that a *denn*-Q can be used to react to a *denn*-Q or to an assertion uttered to answer a *denn*-Q, as in (i):

(i) A: It is snowing.
S: Ist es denn so kalt?
Is it DENN that cold?
A: The thermometer shows -7 degrees.
S: Funktioniert es denn richtig?
Does it DENN work properly?

Now, what kinds of reasons may a speaker S have to stop an update proposal from becoming an actual proposal? From a dynamic point of view taking discourse moves to be functions from input contexts to output contexts, S' reasons may be twofold: They may concern the input or the output context. On the one hand, it could be that S has doubts about whether the conditions on **input** contexts, corresponding to the felicity conditions of the respective speech act, are met. This corresponds to Theiler's reason **(i)** for using a *denn*-Q and typically lines up with resistance uses of *denn*-Qs. On the other hand, it could be that S doesn't know how to make the update in a way such that the **output** context is suitable in the sense that cg_o is consistent[5], Q_o is answerable (by the relevant interlocutor), and TdL_o is executable (by the relevant interlocutor). This corresponds to Theiler's reason **(ii)** for using a *denn*-Q and typically aligns with clarification uses of *denn*-Qs.

3.2. Application to cases 1, 2 and 3

We illustrate our analysis for all three of Theiler's cases 1, 2 and 3, starting with *denn*-Qs reacting to an assertion.

(14) a. A: Tim met Mia yesterday.
b. S: Woher weisst du das denn?
How do you DENN know that?
c. S: Ist sie denn schon aus dem Urlaub zurück?
Is she DENN already back from holidays?

By uttering the assertion (14a), A puts the proposition p (= 'that Tim met Mia yesterday') in the projected cg^* (see Figure 4). Instead of accepting this proposal, S may put a hold on it because S may not be sure that all input conditions are satisfied, e.g., S may not be sure that A had sufficient evidence to render his assertive speech act on p felicitous, see (14b). Alternatively, it may be that p clashes with S's believes, e.g., that Mia is still on holidays. So S is probing a way to revise her believes that will allow for a consistent update of cg with p, see (14c). Figure 4 illustrates this reaction in the Scoreboard model.

	actual			projected		
c_1:	cg_1	Q_1	TdL_{A1}, TdL_{S1}			
A: *Tim met Mia yesterday.* (=p)						
c_2:	cg_1	Q_1	TdL_{A1}, TdL_{S1}	push$(p, \langle\rangle)$		
S: *Is she* DENN *already back from holidays?* (=$\{q, \neg q\}$)						
c_3:	cg_1	Q_1	TdL_{A1}, TdL_{S1}	push$(p, \langle\rangle)$	push$(\{q, \neg q\}, \langle\rangle)$	

Figure 4: *denn*-Q reacting to an assertion.

As illustration of *denn*-Qs reacting to a question consider the discourses in (15):

(15) a. A: Is Mia's brother coming too?
b. S: Hat Mia denn einen Bruder?
Does Mia DENN have a brother?

[5]Consistency of the Common Ground should be understood in a broad sense. On the one hand, there should also be no clash between the Common Ground and the private believes of each interlocutor. On the other hand, depending on the context of the discourse, the interlocutors might ascribe different status to the propositions in the Common Ground; see the discussion on conversational tone in Theiler (2021: 338f).

c. S: Wie heißt denn ihr Bruder?
What is DENN her brother's name?

By uttering the question in (15a), A puts the question *p?* (= 'Is Mia's brother coming too?') on top of the projected Q^*-stack (see Figure 5). Instead of accepting the proposal, S may put a hold on it because S may not be sure that all input conditions are satisfied, e.g., S may not be sure that the presuppositions of *p?* are met, see (15b) and Figure 5. Or it may be that S doesn't know how to answer *p?*, e.g., because she doesn't know who Mia's brother is. So S is trying to get the information that will enable her to answer *p?*, see (15c).

	actual			projected		
c_1:	cg_1	Q_1	TdL_{A1}, TdL_{S1}			
A: *Is Mia's brother coming too?* (=$\{p, \neg p\}$)						
c_2:	cg_1	Q_1	TdL_{A1}, TdL_{S1}		push($\{p, \neg p\}, \langle\rangle$)	
S: *Does Mia* DENN *have a brother?* (=$\{q, \neg q\}$)						
c_3:	cg_1	Q_1	TdL_{A1}, TdL_{S1}		push($\{q, \neg q\}$, push($\{p, \neg p\}, \langle\rangle$))	

Figure 5: *denn*-Q reacting to a question.

Finally, the exchanges in (16) illustrate *denn*-Qs reacting to an imperative.

(16) a. A (Boss): Pick up Mister Maier at the airport tomorrow!
b. S (Driver): Habe ich denn morgen Dienst?
Am I DENN on duty tomorrow?
c. S (Driver): Wann kommt er denn an?
When will he DENN arrive?

By uttering the imperative in (16a), A puts the proposition *p* (= 'S picks up Mr. Maier at the airport tomorrow') in S' projected TdL^*_S. Instead of accepting the proposal, S may put a hold on it because S may not be sure that all input conditions are satisfied, e.g., S may not be sure that A has the authority, see (16b). Or it may be that S doesn't know how to execute the command, e.g., because she doesn't know when Mr. Maier will arrive. So S is trying to get the information that will enable her to execute the command, see (16c) and Figure 6.

	actual			projected		
c_1:	cg_1	Q_1	TdL_{A1}, TdL_{S1}			
A: *Pick up Mr. Maier* (p =pick-up(S, Mr. Maier))						
c_2:	cg_1	Q_1	TdL_{A1}, TdL_{S1}			push($p, \langle\rangle$)
S: *When will he* DENN *arrive?* (= *q?*)						
c_3:	cg_1	Q_1	TdL_{A1}, TdL_{S1}		push($q?, \langle\rangle$)	push($p, \langle\rangle$)

Figure 6: *denn*-Q reacting to an imperative.

3.3. Application to the problematic cases 4 and 5

We now come back to Theiler's case 5, which was illustrated in (5) above:

(17) [S and A are walking by a lake that usually doesn't freeze. S notices that the lake is frozen.]

S: Schau mal! War es denn diesen Winter kälter als normal? = (5)
Look! Was this winter DENN colder than usual?

In Theiler's case 5, a *denn*-Q doesn't react to a previous discourse move but to nonlinguistic contextual evidence. To capture this, we assume (with Clark, 1996 a.o.) that interlocutors naturally try to incorporate perceptual evidence into the Common Ground. Example (5) involves the following steps: The frozen lake is part of a joint perceptual experience of both interlocutors (here made clear by *Look!*). In consequence, p (= 'the lake is frozen') is new public information that needs to be handled. Even in the absence of an explicit assertion move, the interlocutors handle this new information via the update function ASSERTION adding p to cg_i. But now S realizes that moving the projected cg_o^* to the actual cg_o would lead to an inconsistent cg_o, as it clashes with the expected temperature. In order to resolve the situation, S utters a *denn*-Q to place a hold on the discourse at this point and to request information that would render the cg_o consistent (e.g., whether this winter was unusually cold).

Theiler's case 4, illustrated above in (4) can be handled in a similar vein:

(18) [S picks up A at his office to go to a talk as previously arranged.]
S: In welchen Raum findet der Vortrag denn statt? = (4)
In which room does the talk DENN take place?

As in case 5, the *denn*-Q here is not used as reaction to an explicit previous discourse move by the addressee, but as reaction to an implicit (though still public) self-driven move. When picking up A, going to the talk becomes the item on S's projected TdL^* to be executed immediately. S then realizes that she can't execute this action because she is missing information about the room to go to. Therefore S utters a *denn*-Q to get the missing information.

To summarize, cases 4 and 5 have as common denominators: The update proposals are not driven by an explicit previous discourse move by the addressee but rather by implicit (though still public) self-driven moves. The reason to place a hold concerns output suitability rather than input conditions: as input conditions are typically felicity conditions on speech acts, they don't apply in self-driven moves. By distinguishing between update proposals and actual updates, the job of *denn* is defined not as to stop update proposals but as to stop their becoming actual updates. This equally applies after explicit discourse moves and implicit self-driven moves. By allowing proposed updates to be put on hold by objections to the input (= speech act infelicity) and by objections to the output (= lacking suitability), all cases of *denn*-Qs can be covered as objections.

To sum up section 3, we have provided a Scoreboard implementation of Theiler's (2021) idea that *denn* in a question Q signals that the speaker requires an answer to Q in order to proceed with the discourse. We have defined *denn*-Qs as question moves inserted between the update proposal made by the previous move and the corresponding actual update and as raising issues about the input contexts or output contexts of the previous move. The previous move may explicitly stem from a linguistic utterance –Theiler's cases 1, 2 and 3– or implicitly arise as a self-driven move –Theiler's cases 4 and 5. Regardless of how the previous move arises, *denn* uniformly signals that the *denn*-Q intervenes between the update proposal corresponding to the move and the actual update. This discourse function of *denn* fits very naturally with the general conception of discourse underlying the Scoreboard model.

4. No positive answer requirement for *denn*-Qs

Our Scoreboard-based analysis is in fact not equivalent to Theiler's (2021) CI-based analysis. To facilitate comparison, both are repeated below:

(19) Theiler's Felicity condition of *denn* (simplified): = (2)
Denn is felicitous in a question Q iff the speaker S requires a positive answer to Q in order to proceed in the discourse.

(20) a. $c_i + \ulcorner \text{QUESTION}(\textit{denn}\ \phi) \urcorner = c_i + \ulcorner \text{QUESTION}(\phi) \urcorner$ = (12)
b. Felicity constraint:
(i) $cg_i^* \neq \langle\rangle$, or
(ii) $Q_i^* \neq \langle\rangle$, or
(iii) $TdL_i^* \neq \langle\rangle$

While Theiler's original analysis requires a *positive* answer to the *denn*-Q in order to proceed in discourse, our Scoreboard analysis only requires that the *denn*-Q be answered, not that it be answered in the *positive*. Indeed, nothing in the dynamics of the Scoreboard model per se and nothing about the intermediate position of *denn*-Qs between proposed and actual updates derives the need for a positive answer. This raises the following question: Do we need, in addition to our Scoreboard-based proposal in (20), a CI-based condition specific to *denn* along the lines of (19)?

In this section, we argue that the requirement for a positive answer to a *denn*-Q should be dispensed with. First, we present Theiler's analysis in some more detail, including her original motivation for a positive answer requirement and her implementation in terms of highlighting. Second, we present novel examples showing that a positive answer to the *denn*-Q is not always needed in order to proceed in discourse. Third and finally, we tentatively argue that the apparent need for a positive answer in Theiler's original examples follows from current analyses of the asymmetry of polar questions. We conclude that the seeming need of a positive answer in certain contexts is epiphenomenal and should not be written into the lexical conditions of *denn*.

4.1. Theiler's highlighting

To operationalize the requirement for a positive answer to a *denn*-Q, Theiler (2021) employs the notion of *highlighted content* (Roelofsen and Farkas, 2015) and its instantiation. The highlighted content of a *wh*-question (WhQ) is an n-place property arising from λ-abstracting over its *wh*-phrases, while the highlighted content of a polar question (PolQ) is the proposition expressed in its sentence radical, as illustrated in the middle column of (21). If the highlighted content f is an n-place property, $f(d_1,\ldots,d_n)$ is an instantiation of f for any individuals $d_1,\ldots,d_n$; if the highlighted content f is a proposition, f has a unique instantiation, namely the sentence radical proposition itself. This is exemplified in the last column in (21):

(21)

Q	highlighted f	instantiation
Did Ali see Pat?	λw. see(ali,pat,w)	λw. see(ali,pat,w)
Who saw Pat?	$\lambda x.\lambda w$. see(x,pat,w)	λw. see(ali,pat,w) OR λw. see(beth,pat,w) OR ...
Who saw whom?	$\lambda y.\lambda x.\lambda w$. see($x$,$y$,$w$)	λw. see(ali,pat,w) OR λw. see(beth,kate,w) OR ...

(22) Felicity condition of *denn* (adapted from Theiler 2021:333):
It is felicitous for a speaker S to use *denn* in a question Q with **highlighted** property f iff S considers learning an **instantiation** of f a necessary precondition to **proceed** in the discourse.

With these tools at her avail, Theiler formalizes the felicity condition of *denn* as in (22). She motivates the requirement for an instantiation of the highlighted content of the *denn*-Q –i.e., the requirement for a *positive* answer and not just *an* answer to the *denn*-Q– based on the infelicity of some polar questions with *denn*. Let us examine her two main cases.

In Theiler's example (23), conversationalist A has made an imperative move with the propositional content 'S opens the door', but, not knowing whether she can execute this order due to the lack of a key, S cannot proceed in discourse and add the proposition to her *TdL*, so S poses a *denn*-Q. In this context the *denn*-PolQ (23b) is fine, but (23c) is odd:

(23) a. [It is known that only A has a key to open the door.] (Theiler, 2021: ex. (31))
A: You go on and open the door! I'm coming in a minute.
b. S: ✓Brauche ich denn keinen Schlüssel?
Do I DENN not need a key?
c. S: ??Brauche ich denn einen Schlüssel?
Do I DENN need a key?

The contrast can be explained if *denn* is assumed to signal the need of learning a positive answer to the *denn*-Q in order to proceed. For (23b), this requirement boils down to learning that S doesn't need a key (to make the order executable), which matches the context and makes the *denn*-Q felicitous. For (23c), the requirement amounts to learning that S needs a key (to make the order executable); since learning this while lacking a key does not help S proceed, the *denn*-Q is deviant. No contrast would be expected –so goes the argument– if *denn* simply required learning an answer to the *denn*-Q: Since the two *denn*-PolQs (23b) and (23c) have complementary propositions in their sentence radicals, they logically have the same set of potential answers, so that learning an answer to one would be logically equivalent to learning an answer to the other and should equally allow S to proceed, thus leaving the contrast unexplained.[6]

In Theiler's two Annas example (24), conversationalist A has made an assertion move, but,

[6] Once the requirement for a *positive* answer to the *denn*-Q is in place, the requirement results too stringent for examples like Theiler's (i), where, intuitively, the only thing S needs in order to proceed in discourse is *an* answer –positive or negative– to the *denn*-Q. To circumvent this problem, Theiler's definition of "proceeding in discourse" becomes more nuanced for polar Q initiatives, as in (ii.b):

(i) a. [Only people younger than eighteen can buy discounted tickets.] (Theiler, 2021: ex. (24))
b. Am I eligible for the discount?
c. Bist du denn noch unter achtzehn?
Are you DENN below eighteen?

(ii) If the previous move M_{-1} is a question, then, for S to proceed from M_{-1}, S has to accept that the felicity conditions for the question speech act are met and
a. if M_{-1} is a *wh*-question, S has to answer M_{-1},
b. if M_{-1} is a polar question, S has to answer M_{-1} positively.

In the following, we will argue against the requirement for a *positive* answer, making the additional complication in (ii.b) unnecessary. Note that our counterexamples in section 4.2 are crafted in a way that they falsify the need for a positive answer not only in order to proceed but also in order to proceed *positively* with the previous question move, hence also challenging Theiler's more nuanced version of "proceeding in discourse".

not knowing which Anna was meant, S cannot proceed in discourse and integrate the asserted information into the Common Ground, so S posits a *denn*-Q to clarify. Now, the *denn*-WhQ (24b) is felicitous whereas the *denn*-PolQ (24c) is not:

(24) a. [Two Annas: A and S know exactly two people called Anna. One of them lives in Munich, the other one in Berlin. This is commonly known among A and S.]
A: Earlier today, Anna called.
b. S: Welche Anna meinst du denn? (Theiler, 2021: ex. (4))
Which Anna do you DENN mean?
c. S: #Meinst du denn Anna aus München?
Do you DENN mean Anna from Munich?

If *denn* is assumed to signal that learning a positive answer to the *denn*-Q is needed in order to proceed, the contrast between (24b) and (24c) can be derived, as follows. On the one hand, *denn* in the *wh*-Q (24b) signals that learning (any) one of the two instantiations –namely, λw.call(anna.Munich,*w*) and λw.call(anna.Berlin,*w*)– is needed before the actual update of the *cg* takes place. This matches the context and, thus, the *denn*-WhQ is felicitous. On the other hand, *denn* in the PolQ (24c) conveys that learning the unique instantiation –namely, λw.call(anna.Munich,*w*)– is needed before the actual update of the *cg* is carried out. This does not match the real needs portrayed in the context, since learning the other alternative λw.call(anna.Berlin,*w*) would equally allow S to proceed; hence, the *denn*-PolQ is infelicitous. If, instead –so the argument goes– *denn* was assumed to simply signal that learning an answer to the *denn*-Q is needed in order to proceed, the contrast would not be derived. As the two *denn*-Qs (24b) and (24c) contextually have the same potential resolutions, learning an answer to one would be contextually equivalent to learning an answer to the other; hence, both cases would equally allow S to proceed in discourse and the contrast would not be captured.

4.2. Counterexamples to a positive answer requirement

Despite the preceding examples, Theiler's requirement for an instantiation of the highlighted content of the *denn*-Q –i.e., for a *positive* answer to the *denn*-Q– is too strong in the general case: A *denn*-Q does not always require a *positive* answer in order for S to proceed; sometimes, *an* answer to the *denn*-Q –regardless of whether positive or negative– suffices for S to proceed. To see this, consider our first example with a *denn*-PolQ in (25):

(25) [A has previously expressed interest in buying B's start-up company. S has signaled that she would sell her company only if no employees are laid out.]
A: Will you sell me your start-up company?
S: Werden Sie denn Angestellte entlassen?
Will you DENN lay-out employees?

In this context, regardless of whether the answer to this *denn*-Q is positive or negative, S will be able to proceed in discourse and answer A's original question: If the answer to the *denn*-Q is positive, S will answer the original question negatively; conversely, if the answer to the *denn*-Q is negative, S will answer the original question positively. This contradicts Theiler's requirement and yet the *denn*-Q is felicitous. Hence, Theiler's requirement is too stringent.

A second example, now with a *denn*-WhQ, is provided in (26):

(26) [A, the dean of studies, is still looking for an instructor for course Ling567, which is not popular with faculty. S does not want to teach it, but would be willing to do it if nobody else does.]
A: Are you willing to teach Ling567?
S: Wer würde das denn sonst unterrichten?
Who would teach it DENN otherwise?

Here again, both a positive and a negative answer to the *denn*-Q would allow S to proceed in discourse: If the answer to the *denn*-Q corresponds to a positive instantiation –e.g., *Prof. Smith would teach it*–, then S will respond to the original question negatively; conversely, if the answer to the *denn*-Q corresponds to the lack of any instantiation –i.e., the answer is *Nobody would teach it*–, then S will respond to the original question positively. Again, the *denn*-Q is felicitous despite violating Theiler's requirement, showing that it is too strong.

We have shown that Theiler's requirement for learning a *positive* answer to the *denn*-Q in order to proceed in discourse undergenerates felicity: It imposes too stringent conditions that incorrectly rule out felicitous examples as infelicitous. As the need for *an* answer in order to proceed automatically follows from our Scoreboard analysis of *denn*-Qs as stopping update proposals from becoming actual updates and from the general dynamics of discourse, we propose to drop Theiler's CI-constraint altogether from the lexical entry of *denn*.

4.3. Back to the examples supporting a positive answer requirement

But, if the requirement for a *positive* answer in order to proceed is not part of the lexical entry of *denn*, how can Theiler's original examples (23) and (24) be explained? In this subsection, we pursue the hypothesis that the contrasts arise from the interplay of three factors. First, as per the lexical entry for *denn* in (12), a *denn*-Q signals that the previous move M_{-1} has not yet been accepted by S, due to S having doubts about the input felicity or about the output suitability of M_{-1}. Either way, a QUD concerning those input/output aspects implicitly arises for S. Second, via the Maxim of Relation, the partition posited by the *denn*-Q must be directly relevant to the non-acceptance of M_{-1}, that is, it must be in a daughter-mother relation with the corresponding implicit QUD. Third, the surface shape of the *denn*-Q (in relation to the aim of answering its mother-QUD) is determined by general pragmatic pressures independently needed to explain the well-known asymmetry of PolQs, i.e., the asymmetric felicity of asking $[p?]$ vs. $[\bar{p}?]$.[7]

The asymmetric felicity of PolQs has been observed in Bolinger's (1978) extended paradigm, exemplified in (27)-(28),[8] as well as in Büring and Gunlogson's (2000) contextual evidence conditions:

(27) As a request:
a. Do you have sparkling water?
b. #Do you lack sparkling water?

[7]As we will see, though this asymmetry is extensively documented, several analyses currently compete to explain it, with no clear winner yet. Consequently, this part of our account will remain more tentative, in the hope that, once a clear winner emerges, it will fully carry out its duty as our third ingredient.

[8]Bolinger's original contrast involved the positive antonym versions (27a) and (28a) and the corresponding *or-not*-questions. Other authors (AnderBois, 2011; Tabatowski, 2022; a.o.) have extended to the negative antonym versions in (27b) and (28b). Here, we are mostly concerned with the contrast shown in the main text.

(28) As a rhetorical question:
a. Are you crazy?
b. #Are you sane?

Several (partial) analyses in the literature compete to derive this asymmetry (van Rooy and Šafářová, 2003; AnderBois, 2011; Tabatowski, 2022; see also Krifka, 2015, 2017). The key idea is that, even though *[p?]* and *[$\bar{p}$?]* induce the very same partition of the Common Ground (since $\{\lambda w.p(w), \lambda w.\neg p(w)\}$ and $\{\lambda w.\bar{p}(w), \lambda w.\neg \bar{p}(w)\}$ are logically equivalent), the speaker S chooses to express in the sentence radical of a PolQ whichever one of the two propositions is more useful to her; if both propositions are equally useful, S chooses an alternative question (AltQ) disjoining p and $\bar{p}$ (or the corresponding *wh*-question). To see one concrete implementation, van Rooy and Šafářová (2003) couch the notion of "usefulness" in terms of utility value within Decision Theory, where the utility ranking of two propositions may be goal-based, as in (29a), or belief-based, as in (29b):

(29) A proposition p has a higher utility value than its complement proposition $\bar{p}$ if:
a. p being true brings S closer to her goals than $\neg p$ being true, or
b. adding p to S' belief state triggers a wider revision than adding $\bar{p}$ (i.e., p is more unexpected for S than $\bar{p}$).

Under this account, the PolQ asymmetry in requests like (27) follows via the goal-based utility (29a). The goal of S in (27) is to obtain sparkling water. Since p (= 'A has sparkling water') being true brings S closer to her goal than $\bar{p}$ (= 'A lacks sparkling water'), S chooses the p-PolQ in (27a) rather than the $\bar{p}$-PolQ in (27b). The asymmetry in rhetorical questions like (28) follows, under this account, via the belief-based utility (29b). S believes that A is sane, but A just did something that suggests craziness and S needs to reconsider. Since adding p (= 'A is crazy') to S' beliefs would trigger a wider revision than $\bar{p}$ (= 'A is sane'), S chooses the p-PolQ in (28a) rather than the $\bar{p}$-PolQ in (28b).

Equipped with these general tools to distinguish partition-equivalent PolQs, we are ready to go back to Theiler's original examples on highlighting, starting with the "key" example:

(30) a. [It is known that only A has a key to open the door.] = (23)
A: You go on and open the door! I'm coming in a minute.
b. S: ✓Brauche ich denn keinen Schlüssel?
Do I DENN not need a key?
c. S: ??Brauche ich denn einen Schlüssel?
Do I DENN need a key?

Given that A just made move M_{-1}, S infers that A thinks that M_{-1} is licit input-wise and output-wise. But, as it is known that S doesn't have a key to the door, S wonders about why A thinks that the $TdL^*_{o,S}$ resulting from M_{-1} is executable by S. This gives us S' implicit *why*-QUD in (31a). The *denn*-Q is then understood as the daughter of this *why*-QUD, trying a potential answer to its mother-QUD. Intuitively, it can already be seen that the *denn*-PolQ (30b) leads to a coherent explanation relation in (31b) (since not needing a key would explain why A thinks $TdL^*_{o,S}$ is executable), whereas the *denn*-PolQ (30c) leads to an incoherent explanation relation in (31c) (since needing a key while having none wouldn't explain at all why A thinks $TdL^*_{o,S}$ is executable). More formally, and applying van Rooy and Šafářová's (2003) goal-based utility

to this case (in the spirit of Tabatowski, 2022), S' goal is to find an answer to the *why*-QUD; since p (= 'S doesn't need a key') being true brings S closer to achieving this goal than $\bar{p}$ (= 'S needs a key'), p has higher utility than $\bar{p}$, as sketched in (32). This derives the contrast between the felicitous *denn*-PolQ (30b) based on p and the deviant *denn*-PolQ (30c) based on $\bar{p}$.

(31) a. Why does A think that M_{-1} "Open the door!" leads to an executable $TdL^{*}_{o,S}$?
b. ✓ Is it because S needs no key to enter?
c. # Is it because S needs a key to enter?

(32) a. S' goal: To find an answer to the QUD "Why does A think that M_{-1} "Open the door!" leads to an executable $TdL^{*}_{o,S}$?".
b. Proposition p (= 'S needs no key') has a higher utility value than $\bar{p}$ (= 'S needs a key'), since p being true brings S closer to achieving this goal than $\bar{p}$.

We turn to Theiler's "two Annas" example, expanded here from the original (24):

(33) a. [Two Annas: A and B know exactly two people called Anna. One of them lives in Munich, the other one in Berlin. This is commonly known among A and B.]
A: Earlier today, Anna called.
b. S: Welche Anna meinst du denn?
Which Anna do you DENN mean?
c. S: Meinst du denn Anna aus München oder Anna aus Berlin?
Do you DENN mean Anna from Munich or Anna from Berlin?
d. S: #Meinst du denn Anna aus München?
Do you DENN mean Anna from Munich?
e. S: #Meinst du denn Anna aus Berlin?
Do you DENN mean Anna from Berlin?

Given that there are two equally salient Annas, A's assertive move M_{-1} in (33a) is clearly illicit output-wise: It is unclear which $p - p_{Anna.Berlin}$ or $p_{Anna.Munich} -$ should be added to cg^{*}. Hence, intuitively, the issue implicitly arising for S is not a *why*-QUD, but the *how*-QUD in (34a). The *denn*-Q is then understood as a daughter of this *how*-QUD and as positing the partition in (34b). Now, which question form should be used to express this partition? Intuitively, since the context doesn't provide any further goal or belief of S ranking one proposition over the other, the most neutral way to express this partition would be the WhQ in (34c) or the AltQ in (34d), but not the PolQs in (34e)-(34f). More formally, applying van Rooy and Šafářová's (2003) analysis to this case, the context makes goal (35a) available and no other goal or belief by S; since p (= 'A meant $p_{Anna.Berlin}$') being true and $\bar{p}$ (= 'A meant $p_{Anna.Munich}$') being true bring S equally close to achieving this unique goal, p and $\bar{p}$ have the same utility, as sketched in (35). This derives the infelicity of the *denn*-PolQs (33d)-(33e) and the felicity of the *denn*-AltQ (33c) and the *denn*-WhQ (33b).[9]

[9]This analysis à la van Rooy and Šafářová (2003) predicts that, if we fiddle around with the context and an additional goal is added that endows p or $\bar{p}$ with higher utility, the corresponding *denn*-PolQ becomes acceptable. This prediction seems to be borne out, as shown in (i):

(i) [Only two Annas –one from Berlin and one from Munich– are known to A and and his mother S. S wants A to enter a relationship with Anna from Berlin.]
A: Did Anna call?
S: ?Meinst du denn Anna aus Berlin?
Do you DENN mean Anna from Berlin?

(34) a. Mother-QUD: How can we make M_{-1} "Earlier today, Anna called" lead to an updatable cg_o^*?
b. Partition intended by the *denn*-Q: { 'A meant $p_{Anna.Munich}$', 'A meant $p_{Anna.Berlin}$'}.
c. Completely neutral: Which of the two propositions did A mean?
d. Completely neutral: Did A mean $p_{Anna.Munich}$ or $p_{Anna.Berlin}$?
e. Non-neutral: Did A mean $p_{Anna.Munich}$?
f. Non-neutral: Did A mean $p_{Anna.Berlin}$?

(35) a. S' goal: To find an answer to the QUD "How can we make M_{-1} "Earlier today, Anna called" lead to an updatable cg_o^*?".
b. Propositions p (= 'A mean $p_{Anna.Munich}$') and $\bar{p}$ (= 'A mean $p_{Anna.Berlin}$') have the same utility value, since both bring S equally close to achieving this goal.

Importantly, both in (30) and in (33), if *denn* is removed from the PolQs in (30c), (33d) or (33e), the questions are felicitous. This is because a PolQ without *denn* is free to select a mother-QUD other than the one arising from the reason to stop M_{-1}.

In sum, in this section, we have argued that Theiler's requirement for a positive answer to a *denn*-Q is both too strong (ruling out felicitous examples) and superfluous, because examples showing an apparent need for a positive answer can be explained by current analyses of the asymmetry of polar questions. We draw two conclusions from this section. First, the seeming need for a positive answer in certain cases is epiphenomal and should not be written into the lexical conditions of *denn*. Second, the notion of highlighting, which Theiler employs to implement the requirement for a positive answer, is not needed in the analysis of *denn*.

5. Conclusion

Building on and modifying Theiler (2021), we have developed a Scoreboard-based analysis of the discourse particle *denn*. Doing so raised a number of issues that have repercussions beyond the analysis of *denn*. First, the function we propose for *denn* –reacting to a proposed update by putting its acceptance on hold pending a response to the new question– naturally fits the central ideas of the Scoreboard model, specifically the distinction between proposed and actual updates. This lends further support to using context update models to capture the function of discourse particles that are hard to describe in truth-conditional terms.

Second, we have argued that properly implementing the notion of an interleaved discourse move, such as *denn*-Qs, in the Scoreboard model requires treating all components of a context structure (cg, Q. TdL) as stacks rather than sets.

Finally, the basic insights of Theiler's analysis concerning the discourse dynamics of *denn*-Qs are maintained in our proposal. However, beyond the analysis of *denn*-Qs per se, Theiler uses *denn*-Qs to argue that the notion of highlighting is needed in the grammar. We have shown that the hightighting-based requirement should be removed from the meaning contribution of *denn*, thus invalidating this argument for the need of highlighting in the grammar.

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