Accounting for case match and case mismatch in German free relative clauses

An experimental study with Optimality Theory modeling

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Contents

0 List of abreviations

nom	nominative
acc	accusative
dat	dative
mat	match
har	hierarchy harmonic mismatch
opp	hierarchy opposing mismatch
mat-nomnom	nominative match (e.g. *no patience had* ___$_{nom}$ *who*$_{nom}$)
mat-accacc	accusative match (e.g. *hugged* ___$_{acc}$ *whom*$_{acc}$)
mat-datdat	dative match (e.g. *helped* ___$_{dat}$ *whom*$_{dat}$)
har-nomacc	hierarchy harmonic nominative-accusative mismatch (e.g. *no patience had* ___$_{nom}$ *whom*$_{acc}$)
har-nomdat	hierarchy harmonic nominative-dative mismatch (e.g. *no patience had* ___$_{nom}$ *whom*$_{dat}$)
har-accdat	hierarchy harmonic accusative-dative mismatch (e.g. *hugged* ___$_{acc}$ *whom*$_{dat}$)
opp-datacc	hierarchy opposing dative-accusative mismatch (e.g. *helped* ___$_{dat}$ *whom*$_{acc}$)
opp-datnom	hierarchy opposing dative-nominative mismatch (e.g. *helped* ___$_{dat}$ *who*$_{nom}$)
opp-accnom	hierarchy opposing accusative-nominative mismatch (e.g. *hugged* ___$_{acc}$ *who*$_{nom}$)

1 Introduction

1.1. Aim and structure of this thesis

Relative clauses are a highly researched topic and have been for decades. In the linguistic literature on German, free relative clauses in particular have evoked a considerable number of research endeavors trying to elucidate their nature. This thesis specifically investigates case in German free relative clauses, and is the first to show that universal, construction-independent preferences apply to case in German free relative clauses. This will be achieved by discussing preferences identified to be operative in German free relative clauses in previous research and by testing improved versions of the preferences in a study using the online method self-paced reading. Empirical data concerning German free relative clauses was hitherto solely provided using offline methods such as (speeded) acceptability judgements or corpus studies, where results were not fully conclusive.

Thus, this thesis will cover two research desiderata. First, it will replace hitherto construction-specific preferences (Case Match Preference and the Case Hierarchy Preference) that *describe* empirical data with theoretically based and empirically corroborated universal, construction-independent violable preferences that *explain* empirical findings. In this sense, the thesis adds to the existing research an account of free relative clauses characterized with enhanced explanatory adequacy. Second, case in German free relative clauses will be examined using an online method that allows researchers to track incremental processing during sentence comprehension, i.e. the word-by-word updating of sentence interpretation. More specifically, one can map individual words in a clause that are associated with increased processing costs to violations of the universal, construction-independent preferences. This is contrary to previous research using exclusively various offline methods.

To perform this, the present thesis has been divided into seven parts. Chapter 1 provides an introduction to the research interest of this thesis. It highlights different

structural approaches to free relative clauses. It illustrates that such clauses need to be distinguished from indirect questions that are superficially very similar but structurally fundamentally different. This chapter also provides insights into the commonalities shared by free and headed relative clauses. Their structural characteristics are closely related, which has usually been neglected in previous research. However, their commonalities will later turn out to be crucial for the preferences operative in free relative clauses.

In Chapter 2, case in free relative clauses will be discussed. First, the current state of research will be addressed (Chapter 2.1. State of research). In the course of this exploration, the phenomenon of case match (Chapter2.1.1. Case Match in free relative clauses) and case mismatch in terms of the case hierarchy (Chapter 2.1.2. Case Hierarchy Rule in free relative clauses) will be illustrated. Specifically, the Case Match Preference and the Case Hierarchy Preference will be explained. As mentioned above, these preferences are construction-specific and describe, rather than explain, empirical data.

Chapter 2.2.4. (Implementing the principles in free relative clauses) replaces these construction-specific preferences with universal preferences. To do so, the recent inflection theory approach of decomposition will be introduced (Chapter 2.2. Morphosyntactic approach to case free relative clauses). Chapter 2.2.3. (Subset principle and specificity principle for case) shows how cases (relevant to the current thesis) are decomposed into features and how two universal principles associated with feature decomposition provide the option of deriving construction-independent morphological forms rather than formulating individual construction-specific rules. This approach will finally be applied to free relative clauses (Chapter 2.2.4. Implementing the principles in free relative clauses). Subsequently, the preferences (or rules) formulated in previous research are replaced with universal preferences thereby explaining most of the previous empirical findings.

Chapter 3 focuses on the preferences identified for headed relative clauses. As mentioned above, free and headed relative clauses share numerous commonalities that have hitherto mostly been neglected in research. However, it will be shown that the two preferences established to be operative in headed relative clauses are also operative in free relative clauses in a very similar manner. The preference for parallel syntactic functions (Chapter 3.1. Parallel syntactic function in headed relative clauses) between the covert head in the matrix clause and the relative pronoun in headed relative clauses is very similar to the preference for case match in free relative clauses. The preference for subject relative

pronouns in headed relative clauses (Chapter 3.2. Subject Preference for relative pronouns in headed relative clauses) will need adjustments due to the notion of *subject* and *object* being equivocal concerning their thematic roles in Dowty's (1991) proto-agent approach. Specifically, this thesis argues for an account along the terms of semantic roles assigned by the verb to its arguments. As will be explained, a preference for initial agentive arguments appears to be more expedient than a preference for subject relative pronouns. Especially, dative relative pronouns are affected by this preference. This will be crucial in terms of accounting for the results of the experimental study later in this thesis.

Chapter 4 summarizes the insights gained from the preceding chapters and aims at integrating them in a single model that is based on Optimality Theory. Chapter 4.1 (Recapitulation of preferences for free and headed relative clauses) compares the highly similar preferences identified in headed and free relative clauses. Chapter 4.2 (Conflicting preferences in free relative clauses) illustrates which of the three universal, violable preferences operative in free relative clauses prefer which German free relative clause constructions over others. It will be shown that not all preferences can be satisfied simultaneously. Instead, the violable preferences conflict and interact with each other. Finally, Chapter 4.3 (Introduction to Optimality Theory) provides an introduction to Optimality Theory as a powerful tool to model the interaction between these conflicting, violable preferences which are transferred into constraints to fit this framework. This chapter thus sets the general framework, including crucial findings from previous research, that will be used to generate hypotheses and to formulate explanations for the empirical findings presented in the experimental chapter (Chapter 5).

In Chapter 5, the universal, violable preferences, postulated to be operative in German free relative clauses, are tested in a three-part study examining the cases nominative, accusative, and dative. As mentioned above, previous research exclusively made use of offline methods where processing costs cannot be mapped to words or regions of interest and where processing patterns can thus be compared only for sentences in their entirety. The current thesis employed self-paced reading, an online method that provides good temporal and spatial resolution to locate processing difficulties. Specifically, it reveals a detailed image of when and where processing difficulties occur. The results of the experiments conducted here will corroborate the universal, construction-independent preferences postulated for German free relative clauses in this thesis. Importantly, they will

further corroborate the assumption of an interaction of preferences that can be modeled within the Optimality Theory framework, as the interim discussion of the respective experiments will show.

Chapter 6 provides a general discussion of the universal preferences and the similarities with the preferences identified as operative in headed relative clauses. It further discusses the preferences as constraints within the Optimality Theory framework. Optimality Theory, indeed, is the tool that can model the interaction of the preferences as constraints. Data that cannot be captured by this framework will be addressed while explaining why this may have occurred. Alternative approaches to explain the findings of this study will be discussed (i.e. frequency of cases). However, Optimality Theory will prove to be superior as it can account for most data gathered from offline and online methods while other approaches cannot do so. Finally, crucial methodological issues concerning the results will be addressed.

To conclude (Chapter 7), the previous construction-specific preferences (or rules) are replaced by universal, construction-independent preferences that are also operative in similar manners in headed relative clauses described in this thesis. Thus, with the approach of this thesis, the topic of case in German free relative clauses as a highly specific area of research can be embedded in a much larger research context.

1.2. What are free relative clauses?

This thesis is concerned with case in free relative clauses. Specifically, it focusses on different case combinations in free relative clauses in German. To understand the complex structure and peculiarities of free relative clauses, it is helpful to consider headed relative clauses first. Headed and free relative clauses share many commonalities. As shown in Chapter 3 in this thesis, this includes preferences established to operate in headed relative clauses.

Headed and free relative clauses are closely related. In fact, they have often been analyzed in combination in theoretical approaches (cf. Eisenberg 2004[1], Heidolph et al. 1981[2]). On the surface, they only differ concerning their head positions, which is overt for

[1] As Eisenberg (1986: 220 states: "The free relative clause is 'actually' still an attribute because the NP it refers to is still latently there due to the case matching."

[2] Heidolph et al. (1981: 831) argues that albeit their missing NP as a head, they still are attributive relative clauses, and therefore, need to be analyzed like attributive (= headed) relative clauses. Free relative clauses are merely "verkappte Attributivsätze" ("disguised" attributive clauses), as Bausewein (1991: 144) puts it by referring to this statement by Heidolph.

headed relative clauses, see (1.1); and covert for free relative clauses, see (1.2). However, this slight difference entails a number of phenomena where headed and free relative clauses differ from each other. One of them is the possible case combination, as the illustrations in this chapter and Chapter 2.2. (Morphosyntactic approach to case in free relative clauses) will discuss.

First, let us consider headed relative clauses. Relative clauses are an option of nominal modification. They serve the purpose of providing additional information to their head and usually occur adjacent to their head, as shown in (1.1):[3]

(1.1)	*Der Vater umarmte*	*den Jungen*$_{complement}$*,*	*der*$_{COMP}$	*den Sohn korrigierte.*
	The father hugged	the boy$_{acc}$	whom$_{acc}$	the son corrected.

In (1.1) the NP, *der Junge* is the complement of *umarmte* and the head of the relative clause *whom* (= COMP) *den der Sohn korrigierte.* This overt head, however, is not provided in a free relative clause. In free relative clauses, the head is covert (hence, *free* or *headless* relative clause), see (1.2):

(1.2)	*Der Vater umarmte*	*____,*	*wen*	*der Sohn korrigierte.*
	The father hugged	____$_{acc}$	whom$_{acc}$	the son corrected.

As indicated by the underline in (1.2), there is no overt head of the free relative clause. Its head is covert. This is a structural difference between the otherwise structurally very similar free and headed relative clauses. This thesis will show the similarities indicate that the preferences found for headed relative clauses may also be applicable to free relative clauses.

Concerning case (mis)match, free relative clauses were originally assumed to have only occurred in constructions where the case of the covert head (henceforth case$_{matrix}$) and the case of the relative pronoun are identical (henceforth: case$_{relative}$).[4] In case of headed relative clauses, the overt head and the relative pronoun do not need to match. However, research

[3] As the structural information concerning the head of the relative clause and the relative pronoun will be relevant later in this section (see 1.3-1.5) concerning free relative clauses their respective structural positions are provided. This aims to help understand the argumentation for the structure of free relative clauses below. 'Complement' is the complemnt position of the verb in the matrix clause and 'COMP' is the complement position in the relative clause.

[4] In the following, the identical cases between case$_{matrix}$ and case$_{relative}$ will be referred to as *case match*. For details on case match, see Chapter 2.1.1. (Case Match in free relative clauses).

suggests that cross-linguistically matching (= identical) cases of head and relative pronoun are favored over non-matching cases. Ishizuka (2005) finds that in Japanese headed relative clauses case match conditions are read faster than case mismatch conditions in self-paced reading. Levy et al. (2013) find the same for Russian headed relative clauses. Fanselow et al. (1999) confirm this for case matches in German headed relative clauses in a reading time experiment, thereby revealing that case-ambiguous grammatical functions are preferentially assigned to the relative pronoun on the basis of the case borne by the head noun in German (see also Schlesewsky 1997).

While headed relative clauses can have mismatching cases between the head and the relative pronoun, for free relative clauses, as in (1.2), it was long assumed that only matching cases of head and relative pronoun are permitted[5] (cf. Groos & van Riemsdijk 1981, van Riemsdijk 2006; for a critical and detailed discussion see Chapter 2.1.2. Case Hierarchy Rule in free relative clauses). There are different structural approaches to free relative clauses with slightly different assumptions accounting for the assumed rule that covert head and relative pronoun must match concerning case. Three different main approaches[6] are briefly outlined in (1.3)- (1.5) below.

(1.3) The relative pronoun is the complement of the matrix verb and thus the head of the free relative clause. The complementizer position (COMP) in the free relative clause is empty (cf. Grimshaw 1977, Bresnan/ Grimshaw 1978, Ott 2011, Donati and Cecchetto 2011).

[[Der Vater umarmte [wen$_{complement}$]] *[[ø $_{COMP}$]* *der Sohn korrigierte.]*

[[The father hugged [whom$_{complement}$]] [[ø $_{COMP}$] the son corrected.]

(1.4) The relative pronoun fills the complement position of the matrix verb and the COMP position in the free relative clause (cf. Haider 1988a, 1988b, see also Groos/van Riemsdijk 1981, van Riemsdijk 2006).

[Der Vater umarmte *[[wen$_{complement/COMP}$]]* *der Sohn korrigierte.]*

[The father hugged [[whom$_{comple}$ment/COMP]] the son corrected.]

[5] Besides case syncretism. For German, this affects only the relative pronoun *was* which is only used for inanimate nouns and is a syncretism of singular nominative and singular accusative.

[6] Only the main approaches are discussed here. For a more detailed discussion of numerous approaches, see Himmelreich (2017: 176–184).

(1.5) The relative pronoun is in COMP in the free relative clause. Its head—the complement of the matrix verb—remains phonologically empty. It is covert (cf. Citko 2004, Harbert 1983, Himmelreich 2017, Suñer 1984, Grosu & Landmann 1998, Grosu 1996, 2003, Rooryck 1994).

[Der Vater umarmte [$ø_{complement}$]] *[[wen $_{COMP}$] der Sohn korrigierte.]]*

[The father hugged [$ø_{complement}$]] [[whom $_{COMP}$] the son corrected.]]

In the approach in (1.3), according to Grimshaw (1977) and Bresnan & Grimshaw (1978), the relative pronoun is base-generated in the complement position of the matrix verb. Thus, it is the head of the free relative clause and not an element in the same free relative clause. That is, the COMP position of the free relative clause remains (phonologically) empty. Only case matching can occur under this approach. While this approach is in line with the previously assumed rule that the case of the covert head and the case of the relative pronoun must match in free relative clauses, it is unclear why the relative pronoun should be base-generated in the complement position of the matrix verb. This assumption cannot hold for headed relative clauses because the head of the relative clause would fill the position assumed for the relative pronoun in the approach (see 1.1 above). This base generation is unmotivated and does not occur in other syntactic structures. Moreover, COMP remains (phonologically) empty. Ott (2011) and Donati and Cecchetto (2011) have changed this approach slightly. They assume a base-generated relative pronoun in the COMP position of the free relative clause and a movement of the relative pronoun to the complement position of the matrix verb. This, however, does not solve the problem mentioned before. The movement of the relative pronoun out of COMP into the complement position would be as unmotivated as assuming the relative pronoun to be base-generated there. Further, Groos and van Riemsdijk (1981) point out that when extrapositioning the free relative clause, the relative pronoun must move with it. If the relative pronoun is outside the free relative clause, it should remain in its position and not move with the free relative clause. So, while this approach can explain the assumed rule of matching cases between covert head and relative pronoun, it comes with highly problematic assumptions that seem stipulated. They do not occur in other syntactic structures and do not fit the structure for headed relative clauses.

The approach provided in (1.4) assumes the relative pronoun to occupy two positions simultaneously. Thus, neither the complement position of the matrix verb nor the COMP

position of the free relative clause is empty. Haider (1988a: 101) argues that i) projections do not involve empty heads and ii) derivations must not be empty (i.e. string vacuous). These premises invoke an issue addressed by Himmelreich (2017), who points out that there is a difference between a structurally empty position and an entity that happens to be phonologically covert (phonologically empty). Assuming one entity (i.e. the relative pronoun) to occupy two positions is not necessary. Instead, it causes a crucial problem: One entity cannot occupy two positions at the same time. Hence, while this approach can account for the assumed rule of matching cases of the covert head and the relative pronoun, it stipulates problematic assumptions and argues with premises that do not have to apply to the construction.

The approach in (1.5) assumes a structure like the (surface) structure of headed relative clauses (see 1.1.). The relative pronoun occupies COMP in the free relative clause. There is no unmotivated movement, base generation outside the free relative clause, or shared constituent as in the other approaches (see (1.3) and (1.4)). Case match may still occur, but case matching between covert head and relative pronoun is not required as in the other two approaches (see (1.3) and (1.4)). This turns out to be congenial for the empirical findings of case mismatching in previous research (see Chapter 2.1.2 Case Hierarchy Rule in free relative clauses) and for the current thesis (see Chapter 5 Empirical evidence).

The structure of headed and free relative clauses are similar, apart from the overt and covert heads, respectively. A less strict form of the assumed rule of matching cases of covert head and relative in free relative clauses is also detectable in headed relative clauses as will be discussed in Chapter 3.1. (Parallel syntactic function in headed relative clauses). Similar types of acceptable case mismatches seem to occur in headed and free relative clauses.

Albeit the commonalities shared by headed and free relative clauses, they are simple to distinguish from each other due to the first having an overt and the latter having a covert head, as shown in (1.1) and (1.2), respectively. Another yet structurally unrelated construction is hard, sometimes impossible, to distinguish from German free relative clauses on the surface: indirect questions. In fact, the w-elements are similar: The relative pronouns and interrogative particles share the same form[7]. Even though free relative clauses and indirect questions appear similar on the surface, their structural differences lead to several differences in distribution and interpretation.

[7] For discussion of the etymological background of w-elements, see Zakariás (2010: 205).

This part of the section will outline the major differences between free relative clauses and indirect questions. To examine German free relative clauses empirically (see Chapter 5 Empirical evidence), it is crucial to distinguish them unambiguously from indirect questions.[8]

Superficially, free relative clauses and the indirect questions appear identical, and the interpretative differences are often subtle. However, this substantially impacts the structure of the constructions. Free relative clauses do not have an overt head. Thus, the case assigned by the matrix verb cannot be realized there. Rather the relative pronoun of the relative clause is considered. As a result, the covert head and the relative pronoun are closely related to each other. For indirect questions, this is not the case. Their interrogative particle does not refer to or relate any head—either covert or overt. So, they do not exhibit any phenomenon of (mis)matching. Therefore, free relative clauses and indirect questions are fundamentally different constructions concerning their structures and may only appear identical on the surface level. For a comparison of free relative clauses and indirect questions, consider (1.6, cf. Eisenberg 2004: 323–24[9]; slightly changed):

(1.6) Comparison of free relative clauses and indirect questions

a.	*Monika bezahlt,*	*was Manfred ausgesuchte.*
	Monika pays	what Manfred chose.
b.	*Monika vergisst,*	*was Manfred ausgesuchte.*
	Monika forgets	what Manfred chose.

In (1.6) the subordinate clause *was Manfred ausgesuchte* is identical in (1.6a) and (1.6b). By only analyzing the subordinate clause, it is impossible to determine whether it is a free relative clause or an indirect question. The matrix clause, more precisely the matrix verb, needs to be considered. In (1.6a) the matrix verb is bezahlt*,* which does not subcategorize for an indirect question, but it does subcategorize for a free relative clause. Hence, in (1.6a) *was Manfred ausgesuchte* can only be a free relative clause. Turning to (1.6b), the matrix verb is *vergessen* which can subcategorize for an indirect question and a free relative

[8] Note that not all differences between indirect questions and free relative clauses will be discussed (for a more detailed discussion, see Zifonun et al. 1997: 2263–75).

[9] See also Bresnan & Grimshaw (1978: 334).

clause.[10] Hence, in (1.6b) it is impossible to determine whether *was Manfred ausgesuchte* is a free relative clause or an indirect question. The interpretation as a free relative clause would be the following: Monika still remembers that it was the same coat Manfred has chosen, but she cannot exactly remember what kind of coat, what it looked like, etc. She does not forget what kind of item Manfred has chosen but cannot remember the details. The interpretation as an indirect question is the following: Monika forgets what kind of item (or items) Manfred has chosen altogether; she cannot remember whether it was pants, a shirt, or a coat. With a verb like *vergessen*, as in (1.6b) which subcategorize for indirect questions and free relative clauses, it is impossible to determine whether the subordinate clause is one or the other. Zifonun et al. (1997: 2268; slightly changed) specify the possible interpretations in more detail with their example (given in (1.7)) and explanation:

(1.7) *Was du sagtest, ist unklar*
What you said is unclear.

There are two possible interpretations for (1.7). First, the w-element in w*as du sagtest* can be interpreted referentially. That is, *was* directly refers to something specific that has been said. In this case, *was* is a relative pronoun. Thus, w*as du sagtest* is a free relative clause in this context. Second, the w-element in w*as du sagtest* can be interpreted generically. That is, *was* refers to something generic and not to a specific entity. In this context, *was* is an interrogative particle and w*as du sagtest* is an indirect question. Zifonun et al. (1997: 2,268) explain this with the fact that the relative pronoun needs to relate to something specific by definition. An interrogative particle, however, cannot refer to something specific, again, by definition because that is what it interrogates. They continue this argumentation by introducing a „proposition-referring additional interpretation“ (Zifonun et al. 1997: 2268) for indirect questions that can be initiated by verbs like *wissen* (know) which subcategorize for indirect questions and provide an essential reading. Such verbs select a whole (subordinate) clause as a constituent. The matrix verb's argument is not a covert head to refer to, but the argument is the whole indirect question itself (cf. Zifonun et al. 1997: 2268, 2273). For a proposition-referring interpretation, no other structure than an indirect question and no

[10] Note that there are verbs, such as *wissen* (to know) or *erfahren* (to experience), not subclassifying free relative clauses at all.

other than an essential reading is possible. In contrast, the object-referring interpretation provides an essential or referential reading (cf. Zifonun et al. 1997: 2,269); it applies to indirect questions and free relative clauses. The difference in what the w-element refers to, proposition or object, entails some structural differences addressed in the following.

One crucial characteristic distinguishing free relative clauses from indirect questions directly refers to the differentiation of proposition-referring vs. object-referring. Bresnan and Grimshaw (1987: 334) have already pointed out that *-ever* can be suffixed to the w-element iff it is a relative pronoun (see (1.8)). When the w-element is an interrogative particle, suffixing *-ever* is not possible (1.9).

(1.8) I'll buy whatever he is selling.

(1.9) *I'll inquire whatever he is selling.

In (1.8) *what(ever) he is selling* is a free relative clause because *whatever* refers to one or multiple specific items and not to a proposition. Moreover, *buy* does not subcategorize for propositions. That is, it does not subcategorize for indirect questions. The sentence in (1.9) is not grammatical because, as stated before, *whatever* is object-referring and therefore does not fit the proposition-referring characteristic of indirect questions. Further, *inquire* works like *know* or *experience* as it does not subcategorize for objects but only propositions.

A structural difference occurs as a result of free relative clauses having a covert head and indirect questions having no entity in the matrix clause they relate to. Since the free relative clause refers to its (albeit covert) head, it can be adjacent to its head. In fact, it is favored in this position (cf. Eisenberg 2004: 326). Owing to this, a free relative clause is grammatical in the German middle field but an indirect question is ungrammatical at this position. Consider the examples given in 1.10 (Eisenberg 2004: 326):

(1.10)

a. **Er hat, was Hans nun vorhat, gelesen.*
He has what Hans now wants-to-do, read.
'He has read what Hans wants to do now.'

b. *Er hat ___, was Hans ihm mitbrachte, sofort gegessen.*
He has ___, what Hans him brought, immediately eaten.
'He has eaten immediately what Hans brought him.'

In (1.10a) *was* in *was Hans nun vorhat* is proposition-referring and therefore an indirect question. Placing it in the middle field is ungrammatical. In (1.10b) *was* in *was Hans ihm mitbrachte* is object-referring and therefore a free relative clause. While this construction might sound rather complex for some speakers, it is grammatical. The free relative clause can occur adjacent to its covert head, especially if it is in the middlefield (cf. Eisenberg 2004: 326), illustrated for convenience with the underline in (1.10b).

Further, an indirect question can display more than one w-element, while this is impossible in free relative clauses. Consider (1.11) for illustration (example (1.11a): Zifonun et al. 1997: 2273[11]; slightly changed):

(1.11)

a. *Sie schreibt auf,* ***wer was*** *nach ihrem Tod* *bekommen soll.*
*s*he writes down, who what after her passing get should
'She writes down **who** should get **what** after her passing.'

b. ****Was** diese Person* ***wann wo*** *gesagt hat,* *ist unerfreulich.*
what this person when where said has is unpleasent
'***What** this person **when where** said is unpleasant.'

The relative pronoun (the w-element) is object-referring (1.11b) and the interrogative particle or particles (w-elements) in indirect questions are proposition-referring (1.11a). In an indirect question, more than one proposition can be asked for. Therefore, more than one w-element can occur (cf. Zifonun et al. 1997; example (1.11a) is derived from their example on page 2270), but in free relative clauses multiple objects (of different classes) cannot be referred to.

Bausewein (1991: 144) adds another characteristic distinguishing indirect questions from free relative clauses. In indirect questions, modal particles can occur while this is not possible in free relative clauses. Zakariás (2010: 200) points out that in German, a particle like *denn* (loosely translates to "*anyway*" as in "*What did you want anyway?"* and functions as reinforcement) can only be inserted into indirect questions because this particle asks for a knowledge gap (a proposition) and, different than free relative clauses, does not refer to

[11] cf. also Bresnan & Grimshaw (1987: 335).

something specific (an object). So, the insertion of *denn* is not possible in free relative clauses.

Another difference is concerned with the object-referring vs. proposition-referring characteristics of the w-element. A proposition can be referred to by *if* and *that*. This does not hold for referring to objects. Thus, it is possible to test whether verbs subcategorize for objects, propositions, or both (cf. Eisenberg 2004: 327, Zifonun et al. 1997: 2268). If the matrix sentence with the matrix verb cannot be continued with *if* or *that,* the verb does not subcategorize for indirect questions but only for (free) relative clauses (see 1.12)). If such continuations are possible, an interpretation as an indirect question or a (free) relative clause is possible (1.12; Eisenberg 2004: 327).

(1.12)

a. **Sie umarmte, dass du umziehen würdest.*
she hugged that you move would
'*She hugged that you would move.'

b. **Sie umarmte, ob du umziehen würdest.*
she hugged if you move would
'*She hugged if you would move.'

(1.13)

a. *Sie fragt an, dass du umziehen würdest.*
she inquires that you move would
'She inquires that you would move.'

b. *Sie fragt an, ob du umziehen würdest.*
she inquires if you move would
'She inquires if you would move.'

In (1.12) no continuation with *dass* of ob is grammatical. The verb umarmen does not subcategorize for a proposition. Hence, it does not subcategorize for indirect questions and the interpretation of a subordinate clause as an indirect question can be excluded. In (1.13), however, continuation with *dass* of ob is grammatical. The verb *to anfragen* does subcategorize for a proposition but not for an object. So, subordinate clauses following a

matrix sentence with verbs that allow the continuation with *dass* of *ob* can only be verbs subcategorizing for propositions, that is, for indirect questions. Verbs that fail this test (that is, allow for this continuation) need to be excluded from the test material for empirical research (see Chapter 5 Empirical evidence). Note that there are verbs that subcategorize for objects and propositions (cf. Eisenberg 2004 above). Such verbs also need to be excluded.

To summarize, the main difference between indirect questions and free relative clauses is that the former do not have a head in the matrix clause while the latter do. As a result of the covert heads in free relative clauses, the case assigned by the matrix verb cannot be realized with a morphological instantiation. Instead, the relative pronoun of the free relative clause is considered. Consequently, the covert head and the relative pronoun are in close relation to each other. For indirect questions, this is not the case. There is no head—either covert or overt—their interrogative particle refers or relates to.

The relation between covert head and relative pronoun is crucial for the current thesis. Therefore, it is vital that only unambiguous free relative clauses can be part of the test material of the experimental study of the current thesis (see Chapter 5 Empirical evidence). That is, verbs that do not subcategorize for free relative clauses exclusively must be excluded in order to avoid the influence of structures that are beyond the scope of this thesis, such as indirect questions.

In contrast to indirect questions, headed relative clauses can be easily distinguished from free relative clauses. Yet, they seem to share numerous commonalities with each other, such as a matching preference between (c)overt head and relative pronoun (see Chapter 3.1. Parallel syntactic function in headed relative clauses). Considering, this approach, the current thesis will incorporate more general construction-independent preferences than previous research considered for German free relative clauses (see Chapter 2.1.3. Case Hierarchy Rule in free relative clauses and Chapter 2.2. Morphosyntactic approach to case in free relative clauses) and show how these preferences have already been shown to be operative in headed relative clauses.

2 Case in free relative clauses

2.1. State of research

2.1.1. Case match in free relative clauses

The relation between the covert head of the free relative clause and the relative pronoun is complex but still uncertain for German free relative clauses despite intense research (see Chapter 1.2. What are free relative clauses). Languages having free relative clauses always allow for case match (discussed in Chapter 1.2. What are free relative clauses, Groos & van Riemsdijk 1981, van Riemsdijk 2006). This means that the case of the covert head (henceforth: $case_{matrix}$) and the case of the relative pronoun (henceforth: $case_{relative}$) are identical. Some approaches to free relative clauses consider case match to be the only possible free relative clauses construction (Grimshaw 1977, Bresnan and Grimshaw 1978, Ott 2011, Donati and Cecchetto 2011, Haider 1988a, 1988b, see also van Riemsdijk 2006) because the relative pronoun is assumed to be base-generated in the complement position of the matrix verb (for a detailed discussion of this and other approaches see Chapter 1.2. What are free relative clauses). However, for other approaches, only a Case Match Preference might be considered, as formulated in (2.1):

> (2.1) Case Match Preference:
> The case of the covert head ($case_{matrix}$) and the case of the relative pronoun ($case_{relative}$) are identical.

As mentioned above, for German, case match was originally assumed to be the only possible construction for free relative clauses. For examples of case match in German free relative clauses, see (2.2):

(2.2) Examples of all matching free relative clause constructions with nominative, accusative, and dative

a. nominative match (henceforth: mat-nomnom)

Keine Geduld besaß ___,	*wer*	*den*	*Sohn*	*korrigiert*	*hatte.*
no patience had	___$_{nom}$ who$_{nom}$	the$_{acc}$	son$_{acc}$	corrected	had

'No patience had who had corrected the son.'

b. accusative match (henceforth: mat-accacc)

Der Vater umarmte ___,	*wen*	*der*	*Sohn*	*korrigiert*	*hatte.*
the father hugged	___$_{acc}$ whom$_{acc}$	the$_{nom}$	son$_{nom}$	corrected	had

'The father hugged who the son had corrected.'

c. dative match (henceforth: mat-datdat)

Der Vater	*half*	___, *wem*	*der*	*Sohn*	*vertraut*	*hatte.*
the father	helped	___$_{dat}$ whom$_{dat}$	the$_{nom}$	son$_{nom}$	trusted	had

'The father helped whom the son had trusted.'

All sentences in (2.2) are instances of German free relative clauses. Sentence (2.2a) illustrates a nominative case match. The covert head of the matrix and the relative pronoun bear a nominative. The cases of the covert head and the relative pronoun are identical. The sentence in (2.2b) shows an accusative match. Again, case$_{matrix}$ and case$_{relative}$ are identical. The same matching structure, only as a dative match, is provided in (2.2c). They are all equally grammatical. Thus, the Case Match Preference does not distinguish between case match conditions. Some approaches consider case match to be the only possible free relative clauses construction, while for other approaches a preference for case match might be considered. This preference is supported by empirical studies concerning German free relative clauses. Case match conditions were always judged more acceptable and occurred more often than any case mismatch condition (Bausewein 1991, Mewe 2014; Pittner 2003; Vogel & Frisch 2003; Vogel & Zugck 2003; Vogel, Frisch & Zugck 2006; Vogel 2011).

Schlesewsky (1997) has examined cases in German headed relative clauses in a self-paced reading study.[12] He finds that case matches between the (overt) head of the relative clause and the relative pronoun (which he calls *symmetry*) are read significantly faster than

[12] Find more details concerning self-paced reading in Chapter 5.1. (The self-paced reading paradigm).

any case mismatches (which he calls *asymmetry*). While this study differs concerning the research and methodology of previous research on free relative clauses, it is remarkable that the commonalities between headed and free relative clauses (see Chapter 1.2. What are relative clauses) are reflected in a similar preference. Chapter 3 of this thesis will focus specifically on the preferences identified in headed relative clauses and highlight how they may apply to free relative clauses. Match constructions have originally been assumed to be the only possible German free relative clause constructions. Yet, research only provides evidence that match constructions are judged significantly more acceptable and they occur more often than mismatch constructions.

2.1.2. Case Hierarchy Rule in free relative clauses

Instances of case mismatch were originally mostly considered as rare performance errors and thought to be unacceptable in German.[13] Only one of the three approaches to the structure of free relative clauses discussed in Chapter 1.2. (What are free relative clauses) has introduced the possibility of a case mismatch. In fact, evidence against the assumption that only case match constructions are possible for German free relative clauses has been accumulated. Pittner (1991) examined case mismatches and found regularities as to which mismatches occur and which do not. See (2.4) for examples provided by Pittner (1991: 341):

(2.4) Examples of case mismatches in German free relative clauses

a. Nominative-accusative mismatch[14] (henceforth: har-nomacc):

Wen *es zum Lehrerberuf* *hinzieht,* ____ *bevorzugt* *eher* *die*

whom$_{acc}$ it to the teaching career attracts ____$_{nom}$ favors mostly the

geisteswissenschaftlichen *und* *philologischen Fächer* (ZEIT 41/89, 87)

liberal arts and philological studies.

'Who is attracted to a career as a teacher mostly favors the liberal arts and philological subjects.'

[13] A strategy used in some languages like Modern Greek, Romanian, Icelandic, or Gothic is case attraction (Vogel & Frisch 2003: 93). As this is not an option for case resolution in German, it will not be discussed in this thesis. For a discussion on case attraction, see, among others Pittner (1996), Vogel & Frisch (2003).

[14] Note that in this thesis the case mentioned first always refers to the case borne by the covert head in the matrix clause; the case mentioned second always refers to the case born by the relative pronoun in the free relative clause.

b. nominative-dative mismatch (henceforth: har-nomdat):

Punkte	*machte*	____,	*wem*	*es gelang,*	*auf dem Spielstock*
points	got	____$_{nom}$	whom$_{dat}$	it succeeded	on the stick

den Ball durch das gegnerische Tor zu balancieren. (Zeit-Magazin 44–89, 27)

the ball through the enemy's goal to balance

'It scored who succeeded in balancing the ball through the enemy's goal on the stick.'

c. accusative-dative mismatch (henceforth: har-accdat):

Sie lädt ein	____,	*wem*	*sie*	*zu Dank*	*verpflichtet ist.*
she invites	____$_{acc}$	whom$_{dat}$	she	to thank	obliged is

'She invites who she is obliged to thank.'

Pittner (1991) concludes that most instances of case mismatch follow this pattern due to the case hierarchy, as given in (2.6). Pittner understands this as a hierarchy of morphological markedness that plays a crucial role for the evidence found against the claim that only case matches are acceptable constructions for German free relative clauses. Occurrences of case mismatches are characterized by the following rule established by Pittner (1991: 342) and derived from the case hierarchy (see 2.6): the *Case Hierarchy Rule* (see 2.5):

(2.5) Case Hierarchy Rule:

> In a case conflict between the case governed by the matrix verb and the case governed by the verb of the free relative clause, the case governed by the matrix verb can be unrealized if it precedes the case governed by the verb of the free relative clause on the following hierarchy:

(2.6) Case hierarchy: nominative > accusative > dative[15]

According to the Case Hierarchy Rule, constructions with a case conflict in free relative clauses are acceptable if(f)[16] the case of the relative pronoun (henceforth: case$_{relative}$) is more

[15] This thesis is only concerned with nominative, accusative, and dative. Therefore, only those cases are mentioned in (2.6).

[16] It is unclear whether Pittner regards the Case Hierarchy Rule as a rule or as a preference. While the notion of *rule* suggests that there are no (systematic) exceptions (hence: iff), her argumentation with possible influence by the word order or additional word material (see Pittner 1991, 1995 and 2003) suggests that the rule may be meant as a preference.

marked (a case more to the right of the case hierarchy) than the case of the covert head in the matrix clause (henceforth: $case_{matrix}$), as given in (2.4). Thus, these constructions are in harmony with the Case Hierarchy Rule and will henceforth be called *(hierarchy) harmonic mismatch*. Free relative clauses are unacceptable if(f) $case_{relative}$ is less marked (a case more to the left of the case hierarchy) than $case_{matrix}$. Thus, these constructions oppose the Case Hierarchy Rule and will henceforth be called *(hierarchy) opposing mismatch*. Note that in this thesis the case mentioned first always refers to the case borne by the covert head in the matrix clause, while the case mentioned second always refers to the case borne by the relative pronoun in the free relative clause. The established dichotomy of hierarchy harmonic and hierarchy opposing mismatches classifies constructions following the Case Hierarchy Rule as acceptable (even 'grammatical', Pittner 2003) sentences and constructions as opposed to the hierarchy as unacceptable (even 'ungrammatical', Pittner 2003) sentences.

To investigate the Case Hierarchy Rule and gain an empirical insight into the phenomenon, Pittner (Bausewein 1991) has conducted a pilot acceptability study. The participants were asked to rate hierarchy harmonic and hierarchy opposing free relative clauses. Pittner (Bausewein 1991) reports a support for the Case Hierarchy Rule. However, owing to many experimental factors and a lack of reported details of the items, the fillers, and the inference statistical analysis, the reliability of the results is debatable. A corpus study by the same author (Pittner 2003) also supports the Case Hierarchy Rule. Although this study only provides a small number of case mismatching in free relative clauses and the inference statistical analysis is missing, the results are noteworthy. All found instances of case mismatches were hierarchy harmonic mismatches, except for one. The hierarchy opposing accusative-nominative mismatch (opp-accnom) where the covert head is an accusative and the relative pronoun is a nominative (Pittner 2003: 205). Pittner, nevertheless, concludes that the Case Hierarchy Rule applies as she discounts the deviant datum as an exception and possibly a performance error (Pittner 2003: 207).

Vogel's and colleagues' (Vogel & Frisch 2003, Vogel & Zugck 2003, Vogel, Frisch & Zugck 2006, Vogel 2011) research concerning German free relative clauses has culminated in the research of Vogel (2011) which this section will mainly focus on. Vogel (2011) reports a series of three studies[17] examining the different case combinations in the matrix clause and

[17] All information concerning hypotheses, experiment design, and results in this section refer to Vogel (2011), unless stated otherwise.

the free relative clause (nominative, accusative, dative) by utilizing the offline[18] method of *speeded acceptability judgements*[19]. The participants were asked to rate a sentence as acceptable or unacceptable within 550ms. The sentences were presented by rapid serial visual presentation (RSVP). For all experiments, it was found that hierarchy harmonic mismatches (har-nomdat, har-nomacc, har-accdat) were judged significantly more acceptable than the hierarchy opposing mismatches (opp-datnom, opp-accnom, opp-datacc). This is mostly in line with Pittner's (1995, 2003) findings. Recall that Pittner (2003; as well as Mewe 2014 in her paper & pencil questionnaire) found one exception to the Case Hierarchy Rule in her corpus study: The hierarchy opposing accusative-nominative mismatch (opp-accnom). This finding was not corroborated by Vogel's research which found this condition (opp-accnom) to be judged significantly worse than the hierarchy harmonic nominative-accusative mismatch (har-nomacc). This exception from the rule that occurred multiple times throughout research (Pittner 2003; Mewe 2014) is an indicator that Pittner's Case Hierarchy Rule needs to be considered a preference[20] rather than a rule, as given in (2.7):

(2.7) Case Hierarchy Preference:
In a case conflict between the case governed by the matrix verb and the case governed by the verb of the free relative clause, the case of the covert head ($case_{matrix}$) is higher on the case hierarchy than the case of the relative pronoun ($case_{relative}$).

This preference favors a hierarchy harmonic mismatch (har-nomacc, har-nomdat, har-accdat) over a hierarchy opposing mismatch (opp-accnom, opp-datnom, opp-datacc). The Case Hierarchy Preference does not apply to case matches (mat-nomnom, mat-accacc, mat-datdat). The preference is further illustrated in (2.8):

[18] An offline method is characterized by collection of data after the processing is completed (usually after reading a whole sentence). Thus, time-locked processing cannot be captured.
[19] The experiments partly investigated other aspects besides case match and case mismatch, such as the position of the free relative clause or comparisons between free and attributive relative clauses. This thesis will focus on case match and case mismatch in free relative clauses with a preceding matrix clause. For a detailed discussion of the experiments, see Vogel (2011).
[20] As mentioned above, the Case Hierarchy Rule may possibly be meant as a Case Hierarchy Preference by Pittner, considering her argumentation with possible influencing factors such as word order or additional word material (see Pittner 1991, 1995 and 2003).

(2.8) har-nomacc, har-nomdat, har-accdat
are equally preferred over
opp-accnom, opp-datnom, opp-datacc

The Case Hierarchy Preference is concerned with case mismatches and their relationship with each other. It is not concerned with how mismatches compare to case matches. Thus, this preference captures some empirical findings by Mewe (2014), Pittner (Bausewein 1991, Pittner 2003), and Vogel (2011) but neglects the crucial finding that case match constructions were always reported to be judged significantly better than any case mismatch construction (reported by Mewe 201 and Vogel (2011). Interestingly, Schlesewsky (1997) finds a preference similar to the Case Hierarchy Preference for headed relative clauses in his self-paced reading study, which has already been discussed above in Chapter 2.1.1. (Case Match in free relative clauses). Hence, yet another commonality between free and headed relative clauses can be identified here. As stated above, preferences postulated for headed relative clauses in previous research will be discussed and explained in detail in Chapter 3 of this thesis before highlighting how such preferences may be transferred to free relative clauses.

For the time being, it can be stated that while the Case Hierarchy Rule captures most of the empirical findings concerning case mismatches in free relative clauses, it is construction-specific and lacks an explanation for the assumed preference. The following section will show how two principles can account for the Case Hierarchy Preference and the Case Match Preference. In contrast to previous research concerning German free relative clauses, these two principles are universal and construction-independent; they have been derived from theoretical approaches and are corroborated by empirical research.

2.2. Morphosyntactic approach to case in free relative clauses

2.2.1. Previous morphosyntactic approaches to case in free relative clauses

This chapter incorporates recent inflection theories concerning cases in German free relative clauses. Recent inflection theories are concerned with the decomposition of cases into features rather than regarding them as holistic entities. Two general, construction-independent principles that are corroborated by independent research emerge from decomposing cases into features. It will be shown that these principles are also operative as preferences in German free relative clauses.

In contrast to previous research describing empirical data, those preferences can explain i) why case match was always judged as more acceptable and occurs more often than case mismatch in empirical studies (Mewe 2014; Pittner 2003; Vogel & Frisch 2003; Vogel & Zugck 2003; Vogel, Frisch & Zugck 2006; Vogel 2011) and ii) why hierarchy harmonic mismatch was are almost always judged as more acceptable and occurs more often than hierarchy opposing mismatches (Bausewein 1991, Mewe 2014, Pittner 2003; Vogel & Frisch 2003; Vogel & Zugck 2003; Vogel, Frisch & Zugck 2006; Vogel 2011). In contrast, previous research on free relative clauses mostly provided construction-specific rules that focused on a descriptive explanation of empirical data rather than on an explanation of the results.

Let us first recapitulate previous approaches to cases in German free relative clauses before turning to the decomposition of case into features. In previous research (Pittner 1991, 2003, Vogel & Frisch 2003; Vogel & Zugck 2003; Vogel, Frisch & Zugck 2006; Vogel 2011), abstract cases were considered. Morphological aspects (morphological instantiation of cases) were stated to be addressed. However, a closer look revealed that they were addressed only superficially. Specifically, according to Pittner's Case Hierarchy Preference, the case hierarchy is crucial to account for (un)acceptable case mismatches (see Chapter 2.1.2. Case Hierarchy Rule in free relative clauses). She states that the case hierarchy is a hierarchy of morphological markedness but does not elaborate the meaning of *markedness* (for critical discussions concerning markedness see Haspelmath 2006, Ludwig 2001). She neglects recent morphological inflection theories to account for the markedness of abstract cases. It remains unclear what markedness refers to in her approach. The approach of using the case

hierarchy to account for most empirical data of her studies (Bausewein 1991, Pittner 2003 and other researcher's studies) can describe but not explaine the results.

Vogel (2011, see also Vogel 2000, 2001) utilizes Optimality Theory[21] (OT, Prince & Smolensky 1993, 2004) for a theoretical reconstruction of the results of empirical examinations of German free relative clauses. In OT, preferences are transferred into universal, violable constraints. Constraint interaction is captured by ranking constraints and evaluating grammatical structures. A grammatical structure that violates the highest constraint is immediately sorted out. However, a closer look at the three constraints[22] (see 2.9-2.11) reveal that they are very close to Pittner's (1991, see also Bausewein 1991 and Pittner 2003) descriptive generalizations (Vogel 2011: 351):

(2.9) Realise Case(RC): An assigned case requires a morphological instantiation.

(2.10) Realise Case (relativised)(RCr): An assigned case requires a morphological instantiation of itself or a case that is higher on the the case hierarchy.

(2.11) Realise Oblique (RO): Oblique Case must be morphologically realised.

The constraint in (2.9), RC, is the most basic of the three constraints. It states that an assigned case needs a morphological instantiation. This means that the case assigned by the matrix verb (viz. the case of the covert head = $case_{matrix}$) and the case assigned by the verb of the free relative clause (viz. the case of the relative pronoun = $case_{relative}$) must be realized morphologically. The constraint in (2.10), RCr, refers to the case hierarchy. If the morphological instantiation cannot be satisfied, it can be replaced by a case higher (more to the right) on the case hierarchy. On closer examination, this is highly similar to Pittner's Case Hierarchy Rule discussed in the previous Chapter 2.1.2 (Case Hierarchy Rule in free relative clauses. As in Pittner's (neé Bausewein 1991, Pittner 1991, 2003) approach, this is a descriptive generalization rather than an explanation for the data. Turning to the constraint in (2.11), RO also appears to be guided by empirical findings rather than a theoretical background. In Vogel's (2011) approach, no explanation is provided as to why oblique cases (in his approach: dative and genitive) must be morphologically realized, while structural

[21] For a detailed introduction to OT, see Chapter 4.3. of this thesis.

[22] There is another constraint (F) that can be neglected for this illustration.
Faithfulness (F): The input is preserved in the output.

cases (in his approach: nominative and accusative) may remain unrealized.[23] This may account for the supposed exception to the Case Hierarchy Rule (hierarchy opposing accusative-nominative mismatch) which was found by some researchers (Pittner 2003, Mewe 2014). Vogel's OT-approach fails to motivate the notion that only oblique cases need to be morphologically realized while this does not seem so apply to structural cases.

The difficulties associated with (2.10) and (2.11) occur for Vogel's (2011) constraints and for Pittner's (1991, 2003) rule. Both assume that a morphological instantiation of $case_{matrix}$ and $case_{relative}$ is needed. However, both approaches neglect recent inflection theories that are concerned with the decomposition of cases into features as an explanation. Rather, they stick to syntactic case categories where cases are abstract and not decomposed. That is why both approaches cannot explain but merely describe the data. As will be shown in the following, incorporating recent morphological approaches concerning inflection, which consider cases as feature sets, can explain most of the previous empirical data.

2.2.2. Feature decomposition of case

Previous research, specifically concerning the Case Hierarchy Preference, mentioned markedness of case. However, as stated above, for the time being it is unclear what *markedness* refers to in the discussed approaches. Markedness in morphosyntax refers to a marking of entities with features.[24] Features are generated by decomposing abstract entities into features. The idea of decomposing entities originated with Jakobson (1936, 1939, 1941, 1969, see also Trubetzkoy 1939) as it was applied to distinguish between opposition pairs. Instead of regarding the components of the pairs as holistic and abstract, they are decomposed into features. The components were no longer holistic and abstract but rather a set of features. Derived from the decomposition of entities into features, all opposition pairs could be divided into one unmarked component (without features) and one marked component (with features). Jakobson used this approach to distinguish between the nominative and the accusative in Russian. In this opposition pair, the accusative has a feature (is marked), while the nominative does not have features (it is unmarked).[25] Thus, markedness allows for a distinction of otherwise equal cases with the aid of decomposition

[23] This is true for one variant of German identified by Vogel (2011).
[24] For other fields where markedness is relevant see Waugh & Lafford (2000).
[25] Only the cases relevant for the purpose of this thesis will be regarded in more detail (see Chapter 2.2.3. Subset principle and specificity principle for case)

into features. Recent inflection theories, however, mostly do not consider fully specified paradigms. Rather, they use underspecified paradigms. To understand the difference and implications of underspecification, let us first consider a fully specified inflection paradigm on the noun *Frau* ('woman') in (2.12):

(2.12) Fully specified inflection paradigm of *Frau* (‚woman')

Case	**Singular**	**Plural**
Nominative	Frau	Frau-en
Accusative	Frau	Frau-en
Dative	Frau	Frau-en
Genitive	Frau	Frau-en

The paradigm in (2.12) is the traditional inflection paradigm. It has eight cells, each of which is fully specified for case (nom, acc, dat, gen) and number (singular, plural). However, the fully specified inflections only have two distinct morphological forms: *Frau* is a syncretism in all four cases for singular and *Frauen* is a syncretism in all four cases for plural. In fact, syncretisms are very frequent in German inflection paradigms. These syncretisms can often be condensed by creating underspecified categories. In underspecified categories, features are omitted (hence the term underspecified) if they are predictable. By condensing syncretism to underspecified categories, the inflection paradigm becomes strongly reduced (see 2.13):

(2.13) Underspecified inflection paradigm of *Frau* (‚woman')

Frau	[ ]
Frauen	[plural]

The syncretisms of *Frau* in singular across all cases and *Frauen* in plural across all cases mentioned above are summarized. This underspecified paradigm manages to distinguish between distinct cases, even though their morphological form is identical.

The approach of decomposing forms into features does not only make an inflection paradigm reduced due to underspecification but also has the advantage of finding the correct morphological instantiation for a syntactic context via principles (subset principle

and specificity principle will be discussed in Chapter 2.2.3.). Thus, the correct morphological form becomes derivable via universal principles rather than by construction-specific rules. As mentioned above, the following chapter will discuss these universal, construction-independent principles. The Chapter after that (2.2.4. Implementing the principles to free relative clauses) will show that these general, construction-independent principles are applicable to German free relative clauses and can be adjusted to be preferences for such constructions. In contrast to previous construction-specific preferences (or rules) describing empirical findings concerning German free relative clauses, these general, construction-independent preferences can explain empirical data.

2.2.3. Subset principle and specificity principle for case

Based on the case feature specifications developed by Bierwisch (1967, see also Wunderlich 1997; for a summary and discussion on features concerning case, gender and number, see Müller 2003; see also Gallmann 1998 for a discussion of underspecification), the three cases relevant to this thesis can be decomposed[26], see (2.14):

(2.14) Decomposed cases of German with privative features

a. Nominative: []
b. Accusative: [objective]
c. Dative: [objective] [oblique]

The nominative is unmarked; it has no case features. More marked than the nominative is the accusative with the feature [*objective*]. More marked than the accusative is the dative with the features [*objective*] and [*oblique*]. The sets of features of the cases higher up (all entities to the left) on the case hierarchy are subsets of the sets of features of the cases lower (all entities to the right) on the case hierarchy. The subset principle (see 2.14) is a crucial aspect of the approach of decomposing inflection forms into features. Underspecified

[26] This thesis uses privative features—i.e. a feature is either given or not.
Note that there are approaches using binary features. That is, instead of a feature being given or not, features have a positive or negative markedness. This thesis only uses privative features because there is evidence that they play a much bigger (possibly the only) role for the subset principle (cf. Penke et al 2004, Penke 2006, among others).

paradigms are one of the central principles concerning the derivation of morphological instantiations for a given syntactic context (see (2.15), cf. Opitz et al. 2013: 236[27]).

(2.15) subset principle:
A morphological exponent, M, is compatible with a syntactic context, S, if M realizes a (proper or improper) subset of the morphosyntactic feature set of S.

This principle ensures compatibility concerning the specification of features between a morphological exponent and a syntactic context. Let us now adapt decomposed cases and the subset principle to German examples in (2.16):

(2.16)[28]

a. *Der Vater*	*umarmte*	*der*[29]	*Junge*
	[objective]	[ ]	
b. *Der Vater*	*umarmte*	*den*	*Jungen*
	[objective]	[objective]	
c. *Der Vater*	*umarmte*	*dem*	*Jungen*
	[objective]	[objective]	
		[oblique]	
the father	hugged	the	boy

'The father hugged the boy.'

According to the subset principle, the sentences in (2.16a) and (2.16b) are compatible to the given context of the verb *umarmen* which requires the case feature [objective]. In (2.16b), the set of features of the case of the article *den* fits the required case features as its case specification is also [objective]. That is, the set of case features of *den* is an improper subset of the set case features required by the verb *umarmen*. Turning to (2.16a), *der* is also

[27] Opitz et al. 2013 call this principle *compatibility* rather than *the subset principle*. The idea of this principle is the similar. It can also be found under the notions of Elsewhere Principle/ Condition, Blocking Principle, Panini's Principle/ Paninian Principle, and Proper Inclusion Principle, among others (see Anderson 1992 Di Sciullo & Williams 1987, Fanselow 1991, Halle 1997, Halle & Marantz 1993, Kiparsky 1973, Lumsden 1992, Noyer 1992, Stump 2001, Williams 1994, 1997, Wunderlich 1997b, 2004, Wiese 1999, among others).
[28] The case feature specifications of the case required by the verb *umarmen* are provided right below the verb. The case features of the case given in the articles are provided right below the articles.
[29] Note that only the set of case features are provided for the article. Gender or number features are neglected here.

compatible with the given context because it does not have any features. Its set of case feature specification is a subset of the set of case features required by the verb. In (2.16c), this is not the case as the set of case features of *dem* ([objective], [oblique]) is not a subset of the set of case features required by the verb. So, according to the subset principle, (2.16a) and (2.16b) are compatible with the context. However, only *den* in sentence (2.16b) is the correct inflection. Thus, another principle is needed to distinguish between the compatible exponents for the given context to identify the correct inflection. Examining both compatible exponents, it becomes apparent that the set of case features of *den* (in 2.16b) is not only a subset of the required case features of the verb (i.e. compatible with the syntactic context), but it is the most specific of the two inflections forms with compatible feature sets (*der* and *den*). Specificity distinguishes between compatible exponents. Specificity is defined in (2.17) (cf. Opitz et al 2013: 237):

(2.17) specificity:
A morphological exponent M1 is more specific than a morphological exponent M2 if M1 realizes more features than M2.

The morphological exponentwith the most specific feature set of the two compatible ones (*der* and *den*) in the given context ([objective] is required) is *den*. Recall, *der* is featureless and *den* has the feature [objective]. Hence, another principle derived from the observation that specificity distinguishes between two compatible forms (viz. morphological forms obeying the subset principle), can be formulated: the specificity principle ((2.18), cf. Wiese 1999: 4):

(2.18) specificity principle:
In a context with multiple compatible morphological exponents, the morphological exponent with the highest specificity is chosen.

In sentence (2.16b), the subset principle and the specificity principle are obeyed by the article *den*. In sentence (2.16a), the subset principle is obeyed and the specificity principle is violated by the article *der*. In (2.16c), the subset principle and the specificity principle are violated by the article *dem*.

The specificity principle can distinguish between the two compatible morphological exponents in (2.16a and b). Sentence (2.16b) provides the most specific morphological exponents *den* of the two morphological exponents compatible with the syntactic context *der* and *den*. Consequently, the latter morphological exponent is chosen for the syntactic context. Empirical evidence can be found for both principles. Let us first consider the subset principle.

A study by Penke et al. (2004), utilizing morphosyntactic features, demonstrates that the morphological instantiation of cases having incorrect inflections do not always have the same consequences for language processing. Incorrect inflection with features that are a subset of the features of the correct inflection for the syntactic context do not elicit longer reading times vis-a-vis the correct inflection, while incorrect inflection with features that are not a subset of the features of the correct inflection elicit significantly longer reading times vis-a-vis the correct inflection.

Penke et al. (2004) have examined inflected adjectives in a sentence-matching paradigm. Two sentences were presented on a screen. The first appeared on the top left-hand side and the second appeared shortly after on the bottom right-hand side. Both sentences remained on the screen while participants were asked to judge as rapidly and accurately as possible whether the sentences were identical or not. The reaction time is thought to reflect the processing ease of the participants solving the task. Increased reaction times suggest processing difficulties when deciding if two sentences, with correct or incorrect inflection, are identical. The processing difficulties can then be linked with the experimental manipulation of the study. The experiment had a 2x2 design. That is, the sentence pairs could be correct and identical or not identical, or incorrect and identical or not identical. An example of the sentences given to the participants to read is provided in (2.19), including their feature specifications[30] (Penke et al. 2004: 427)[31]:

[30] The notions of case feature specifications used on this thesis were adapted to the features in (2.19). This is solely a difference in naming to keep the notions consistent throughout this thesis. The difference is naming does not entail a difference in meaning.

[31] Note that Penke et al. assume binary features. However, their study suggests that only positively marked features are affected by the subset principle. This is why binarity was neglected in this illustration. Moreover, as already shown in Mewe (2014) and in this section below, it is assumed that privative features are sufficient to account for the empirical data of German free relative clauses on a theoretical level.

(2.19) Examples of the test sentences[32] with the syntactic context: [oblique] [plural]

a.	*Er wohnte inmitten*	*toleranter*[33]	*Nachbarn.*
		[oblique] [plural]	
b.	*Er wohnte inmitten*	*tolerante*	*Nachbarn*.
		[plural]	
c.	*Er wohnte inmitten*	*tolerantem*	*Nachbarn*.
		[objective] [oblique]	
	he lived among	tolerant	neighbors

'He lived among tolerant neighbors.'

The feature specifications of the correct inflection are given in (2.19a): [oblique] and [plural]. These features differ from the feature specifications of the incorrect inflections in (2.19b; [plural]) and (2.19c; [objective] and [oblique]). However, their ungrammaticality is not processed equally. The set of features of the incorrect inflection given in (2.19b; [plural]) is a subset of the set of features required for the syntactic context ([oblique] and [plural]). In other words, the set of features of (2.19b) is compatible with the syntactic context. Turning to (2.19c), there is one feature [objective] that opposes the set of features required for the syntactic context ([oblique] and [plural]). Thus, the set of features of the incorrect inflection in (2.19c; [governed] and [oblique]) is not a subset of the set of features required for the syntactic context ([oblique] and [plural]). In other words, the set of features of the incorrect inflection in (2.19c) is incompatible with the set of features of the syntactic context.

Significant reaction time differences could only be detected for inflections whose feature specifications are not a subset of the set of features required for the syntactic context (which Penke et al. 2004 called *ungrammaticality effect*). This means that the ungrammaticality effect could only be detected between examples like (2.19a) und (2.19c), but not between examples like (2.19a) and (2.19b). Iff the set of feature of the incorrect inflection was a subset of the set of features required for the syntactic context there was no significant reading time difference vis-a-vis the correct inflection (similar effects can be found in Opitz et al. 2013; Opitz & Pechmann 2014). Thus, only incorrect inflection with a set of features that is incompatible with the set of features required for the syntactic context

[32] The inflection is emphasized with an underline. The features associated with the inflection are provided in brackets underneath each inflected adjective.
[33] The inflection the provided feature specifications refer to is underlined.

caused significantly delayed reaction times vis-a-vis the correct inflection. Compatible sets of features (viz. an inflection with a subset of features of the set of features of the syntactic context) of the incorrect inflection form compared to the correct inflection form did not cause significantly delayed reaction times (viz. no ungrammaticality effect). This experiment provides evidence for the subset principle. Note that a feasible statement concerning the specificity principle is not possible regarding this study. This might be due to the method. The sentence-matching paradigm records the reaction times in terms of button pressing by the participants. Thus, the reaction time measurements are not direct responses to processing ease or difficulty and the method might not be time-sensitive enough to be tested for the specificity principle. This is in line with Opitz et al.'s (2013) argumentation that a violation of the subset principle is a "major violation for the system" (Opitz et al. 2003: 245) as the set of features of the inflection is incompatible with the context, while the violation of the specificity principle "can be regarded as a minor violation" (Opitz et al 2013: 245) because the set of features of the inflection may not specific enough but is still compatible with the context. This minor violation of the specificity principle may not be detectable in a sentence-matching task, as shown in the study of Penke et al. (2004).

Another study with a more time-sensitive method (ERP, event-related potential[34]) and thus more direct responses than the participants' button pressing could not only account for the subset principle, but also for the specificity principle. Opitz et al. (2013) have examined adjective inflection in their ERP study. ERPs are time-locked multidimensional measurements of brain activity when encountering a critical stimulus. Potential changes in the electroencephalogram (EEG) are measured to examine the electrophysiological response of the brain to a stimulus. Positive and negative changes in relative to a critical change are recorded concerning four parameters: latency, polarity, topography, and amplitude (Bornkessel et al. 2003: 272). These parameters are used to classify different components. Different components are associated with certain aspects of processing, such as morphosyntactic processing (LAN = left anterior negativity) or language repair and reanalysis for the P600[35] (Osterhout and Holcomb 1992; Hagoort et al. 1993). A P600 means that there

[34] Event-related potentials will also be discussed in Chapter 3.3. (Deconstructing the subject notion) of this thesis.

[35] Further components will be discussed in Chapter 3.3. (Deconstructing the subject notion) of this. For a detailed discussion of the components, see Bornkessel-Schlesewsky & Schlesewsky (2009). For other aspects of processing, the P600 is associated with, see Burkhardt (2006), Bornkessel-Schlesewsky & Schumacher (2016), and Schumacher (2014).

is a negativity (N) with a peak around 600ms after the onset of the critical stimulus. The components are always measured in relation to a control condition and never in absolute terms. The incremental nature, the multidimensional measurements of the brain's response to a stimulus, the high time-sensitivity, and the components linked with specific processing tasks make the ERP method very suitable to test for the subset principle and the specificity principle. As mentioned above, the latter is presumed to be only a minor violation and therefore more difficult to detect.

Opitz et al.'s (2013) study is concerned with correctly and incorrectly inflected word forms embedded in plausible contexts. Specifically, they were interested whether feature specifications, the subset principle and the specificity principle are merely a theoretical background or if they are reflected in the brain's responses to language material. Their language material consisted of a preposition with a noun phrase that included an adjective (e.g. *ohne neues/*neuen/*neue Genre*; 'without new genre'). They measured on the noun as only when encountering the noun, it becomes apparent if the adjective inflection is correct or incorrect. Incorrect adjective inflections were subclassified into incorrect but compatible inflections (incorrect1), and incorrect and incompatible inflections (incorrect2). Incorrect1 inflection obeys the subset principle; incorrect2 inflection disobeys the subset principle. Of course, correct inflection obeys the subset principle and the specificity principle.

Opitz et al. (2013) have found a greater effect (a stronger LAN[36]) on the nouns of the condition with incorrect2 adjective inflection (viz. incompatible) for morphosyntactic contexts with neuter nouns[37] vis-a-vis the nouns in the condition with the incorrect1 adjective inflection (viz. compatible). Opitz et al. (2013) conclude that the different effects for two conditions that are both incorrect inflection forms must be attributed to their different status concerning the compatibility to the context (viz. (dis)obeying the subset principle). They also found evidence for the specificity principle. While the LAN differentiates only between incorrect inflections that are compatible and not compatible, respectively,

[36] LAN stands for left anterior negativity. It is one of the components that can be found in ERP experiments and associated with morphosyntactic processing; specifically with the brain's response on error detection. Further details on this method and on other components can be found in this thesis in Chapter 3.3. (Deconstructing the subject notion). For a detailed overview or ERP and all components, see Bornkessel-Schlesewsky & Schlesewsky (2009).

[37] It was predicted that these results would only occur on neuter nouns. The study's language materials contained correct adjective inflection, incorrect1 adjective inflection (compatible, obeying the subset principle) and incorrect 2 adjective inflection (incompatible, disobeying the subset principle). For contexts with feminine nouns, both incorrect inflections were incompatbile (incorrect2). For contexts with masculine nouns, both incorrect inflections were compatbile (incorrect1). This was due to the feature structure of the nouns. For details, see Opitz et al. (2013: 245/6 and 250).

within the given context, the component P600[38] is found to differentiate between correct inflection forms (those obeying the subset principle and the specificity principle) and both incorrect inflection forms (disobeying the specificity principle, including the inflection forms obeying the subset principle). Incorrect adjective inflection (incorrect1 and incorrect2 alike) elicited a P600 on the noun vis-a-vis correct adjective inflection. Opitz et al. (2013) argue that this result is a consequence of the specificity of the correct inflection compared to both incorrect inflections because it implies correct versus incorrect inflections.

Thus, these experiments provide further neurolinguistic evidence of decomposing morphological forms into features. It also supports the idea that the subset principle and the specificity principle reflect language processing. Specifically, it is reflected in the brain's response to language material. Decomposition and feature analysis, combined with the subset principle and the specificity principle, are crucial for explaining the results of the studies above. Sticking to abstract forms (i.e. both incorrect inflections vis-a-vis the correct inflection) could not have provided the fine-grained differences found within incorrect inflections as well as between compatible incorrect and correct inflections.

To summarize, two principles based on case decomposition into privative features were postulated. First, there is the *subset principle* that distinguishes between compatible and incompatible morphological exponents. Second, there is the *specificity principle* stating that of all (compatible) morphological exponents, the most specific one is chosen. Note that these theoretical principles are universal and construction-independent.

2.2.4. Implementing the principle in free relative clauses

The two universal, construction-independent principles discussed above in Chapter 2.2.4 (Implementing the principles in free relative clauses; subset principle and specificity principle) were used in previous research concerning German free relative clauses. Mewe (2014) uses these principles in her approach to account for the empirical findings of case (mis)matching in German free relative clauses (for empirical studies see Bausewein 1991, Mewe 2014, Pittner 2003, Vogel & Frisch 2003, Vogel & Zugck 2003, Vogel, Frisch & Zugck 2006, Vogel 2011; for a similar approach see Himmelreich 2017, for Himmelreich's earlier works see Assmann 2013a, 2013b, 2014). She uses the decomposed cases of the covert head and of

[38] This component P600 is concerned with language reanalysis and repair. For details on this and other components, see Bornkessel-Schlesewsky & Schlesewsky (2009).

the relative pronoun and adopts the framework of the subset principle and the specificity principle for German free relative clauses. For convenience, the set of features for the cases relevant to this thesis are provided again in (2.30; Mewe 2014: 61)[39]:

(2.30) Privative features of German cases

a. Nominative: []
b. Accusative: [objective]
c. Dative: [objective] [oblique]

Recall from above, the nominative has no features (it is underspecified). More marked than the nominative is the accusative with the feature [objective]. More marked than the accusative is the dative with the features [objective] and [oblique]. The set of features of cases higher up (all entities to the left) on the case hierarchy displays subsets of the sets of features of cases lower (all entities to the right) on the case hierarchy. The features of the respective German relative pronoun form in nominative, accusative, and dative are provided in (2.31):

(2.31) Privative feature for German relative pronouns

a. wer ('who$_{nom}$'): []
b. wen ('whom$_{acc}$'): [objective]
c. wem ('whom$_{dat}$'): [objective] [oblique]

Using the subset principle, the Case Hierarchy Preference formulated in Chapter 2.1.2. (Case Hierarchy Rule in free relative clauses) can be formulated as a Subset Preference for German free relative clauses, as given in (2.32):

(2.32) Subset Preference:
A morphological exponent, M, is compatible with a syntactic context, S, if M realizes a (proper or improper) subset of the morphosyntactic feature set of S.

[39] Note that the genitive is excluded in this thesis. The genitive is not generally examined in research concerning free relative clauses. Further, its feature specification is strongly debated (for a detailed overview of different approaches on feature specifications of the genitive, see Müller 2003)

Applied to case in German free relative clauses this means that if the sets of case features of the covert head and the relative pronoun are not identical, the set of features of the case of the covert head (henceforth: $case_{matrix}$) is a (proper or improper) subset of the set of features of the case of the relative pronoun (henceforth: $case_{relative}$). The Subset Preference accounts for most empirical data concerning German free relative clauses and is corroborated by independent research (see Penke et al. 2004, Opitz et al. 2013 and Opitz & Pechmann 2014, among others). Let us now implement decomposed cases and the Subset Preference in examples with German free relative clauses in (2.33):

(2.33) Examples of German free relative clauses with case features

a. hierarchy harmonic accusative-dative mismatch

Der Vater umarmte	___,	*wem*	*der*	*Sohn*	*vertraut.*
	[objective]	[objective] [oblique]			
the father hugged	$\_\_\__{acc}$	$whom_{dat}$	the	son	trusts

'The father hugged whom the son trusts.'

c. hierarchy opposing dative-accusative mismatch

Der Vater	*half*	___,	*wen*	*der*	*Sohn*	*korrigiert.*
		[objective] [oblique]	[objective]			
the father	helped	$\_\_\__{dat}$	$whom_{acc}$	the	son	corrects

'The father helped whom the son corrects.'

In (2.33a) the set of case features of $case_{matrix}$ is a subset of the set of case features of $case_{relative}$ (*wem*). Thus, (2.33a) obeys the Subset Preference. Turning to (2.33b), the set of the case features of $case_{matrix}$ is not a subset of the set of case features $case_{relative}$ (*wen*) but vice versa. Thus, (2.33b) does not obey the Subset Preference. Consequently, according to the Subset Preference, a hierarchy harmonic mismatch is preferred over a hierarchy opposing mismatch. For a general illustration of the Subset Preference applied German free relative clauses, see (2.34)[40]:

[40] The arrow pointing down means 'more acceptable than'.

(2.34) a. hierarchy harmonic mismatch

(set of case features $case_{matrix} \subseteq$ set of case features $case_{relative}$)

↓

b. hierarchy opposing mismatch

(set of case features $case_{matrix} \supset$ set of case features $case_{relative}$)

In (2.34a hierarchy harmonic mismatch) the set of features of $case_{matrix}$ is a (proper or improper) subset of the set of features of $case_{relative}$. That is, the features are compatible (albeit not specific) with the syntactic context. In (2.34b hierarchy opposing mismatch) the case features of $case_{matrix}$ are not a subset of the case features of $case_{relative}$. Therefore, they are not compatible with the syntactic context. This explains why empirical studies continuously found hierarchy harmonic mismatches to be more acceptable than hierarchy opposing mismatches. Additionally, the Subset Preference explains why Pittner's (1991) Case Hierarchy Preference describes the acceptability decline found in empirical data. According to Pittner's approach (see Chapter 2.1.2. Case Hierarchy Rule in free relative clauses), the case hierarchy is a hierarchy of morphological markedness. Lower cases on the case hierarchy (cases to the right) code higher markedness. Higher markedness is derived from a higher number of features. Consequently, the case hierarchy is a direct consequence of the feature specifications of cases. Thus, when the Subset Preference applies to German free relative clauses, it entails that the Case Hierarchy Preference must apply. However, it is merely an epiphenomenon. The explanation is provided by case features combined with the Subset Preference.

The approach of utilizing privative features cannot only account for the acceptability decline from hierarchy harmonic mismatches to hierarchy opposing mismatches. It can also account for the acceptability decline from case match to case mismatch found in previous studies. Free relative clauses with case match (constructions where the covert head and the relative pronoun bear the same case) were always preferred over any case mismatch in previous research (Mewe 2014, Vogel 2011). This can be accounted for by the previously mentioned specificity principle applied to German free relative clauses as the Specificity Preference for German free relative clauses, given in (2.35).

(2.35) Specificity Preference:

In a context with multiple compatible morphological exponents, the morphological exponent with the highest specificity is chosen.

Applied to case in German free relative clauses this means that of all compatible sets of case features of the covert head with the context, the set with the highest specificity is chosen. The most specific compatible set of case features of the covert head (viz. the set satisfying the subset principle) for a given context in German free relative clauses is always a case match. In a case match, the set of case features of $case_{matrix}$ and the set of case features $case_{relative}$ are identical. Thus, the set of case features of $case_{matrix}$ is the most specific of the compatible sets of case features. In any case mismatch, the set of case features of $case_{matrix}$ and of $case_{relative}$ are not identical. Thus, the set of case features of $case_{matrix}$ is not the most specific of the compatible sets of case features. Therefore, case match is preferred over case mismatch. Let us now implement decomposed cases and the Specificity Preference in examples of German free relative clauses in (2.36):

(2.36) Examples of German free relative clauses with case features

a. accusative match

Der Vater umarmte	___,	*wen*	*der*	*Sohn*	*korrigiert.*
	[objective]	[objective]			
the father hugged	$\_\_\__{acc}$	$whom_{acc}$	the	son	corrects

'The father hugged who the son had corrected.'

b. hierarchy harmonic accusative-dative mismatch

Der Vater umarmte	___,	*wem*	*der*	*Sohn*	*vertraut.*
	[objective]	[objective] [oblique]			
the father hugged	$\_\_\__{acc}$	$whom_{dat}$	the	son	trusts

'The father hugged whom the son trusts. '

c. hierarchy opposing dative-accusative mismatch

Der Vater	*half*	*___,*	*wen*	*der*	*Sohn*	*korrigiert.*
		[objective] [oblique]	[objective]			
the father	helped	___$_{dat}$	whom$_{acc}$	the	son	corrects.

'The father helped whom the son corrects. '

The most specific compatible set of case features of $case_{matrix}$ for the context is given in (2.36a). Thus, example (2.36a) obeys the Specificity Preference. Since the most specific set of case features of $case_{matrix}$ for the given context is only provided by a case match in German free relative clauses (2.36a), both mismatches are dispreferred against case matches because they do not obey the Specificity Preference. While (2.36b) obeys the Subset Preference, as discussed above, it does not obey the Specificity Preference. Example (2.36c) obeys neither the Subset Preference nor the Specificity Preference.

Consequently, according to the Specificity Preference, a case match is preferred over any case mismatch, including a hierarchy harmonic mismatch. For a general illustration of the Subset Preference and the Specificity Preference combined and applied to German free relative clauses, see (2.37):

(2.37) a. case match

(set of case features $case_{matrix}$ = set of case features $case_{relative}$)

↓

b. hierarchy harmonic mismatch

(set of case features $case_{matrix}$ $\subseteq$ set of case features $case_{relative}$)

↓

c. hierarchy opposing mismatch

(set of case features $case_{matrix}$ $\supset$ set of case features $case_{relative}$)

The illustration provided in (2.37) differs from the illustration in (2.34) only by the added case match to combine the Subset Preference and the Specificity Preference. In a case match, the set of case features of $case_{matrix}$ and the set of case features of $case_{relative}$ are most specific (= identical). In a hierarchy harmonic mismatch, the set of case features of $case_{matrix}$

is a subset of the set of features of $case_{relative}$ (viz. the set of case features of $case_{matrix}$ is compatible with the set of case features of $case_{relative}$). In a hierarchy opposing mismatch, however, the set of features of $case_{matrix}$ is not a subset of the set of features of $case_{relative}$ (viz. the set of case features of $case_{matrix}$ is incompatible with the set of case features of $case_{relative}$). This is how the acceptability decline between case match and case mismatch as well as among the case mismatch conditions found in empirical studies can be explained by utilizing the Subset Preference and the Specificity Preference. A case match satisfies the Subset Preference and the Specificity Preference. A hierarchy harmonic mismatch satisfies the Subset Preference, but it violates the Specificity Preference. A hierarchy opposing mismatch violates the Subset Preference and the Specificity Preference.

For the construction of the current thesis this means that a hierarchy harmonic mismatch (har-nomacc, har-nomdat, har-accdat) is preferred over a hierarchy opposing mismatch (opp-accnom, opp-datnom, opp-datacc) due to the Subset Preference. Moreover, a case match (mat-nomnom, mat-accacc, mat-datdat) is preferred over a case mismatch due to the Specificity Preference. For an illustration of how the Specificity Preference and the Subset Preference apply to German free relative construction see (2.38):

(2.38) mat-nomnom, mat-accacc, mat-datdat
are equally preferred over
har-nomacc, har-nomdat, har-accdat
are equally preferred over
opp-accnom, opp-datnom, opp-datacc

The two theoretical principles (subset principle and specificity principle) put forward use case decomposition into features. The principles utilizing features are oriented on the recent morphosyntactic theories supported by psycholinguistic research. They are not construction- or language-specific but are general principles applicable to numerous different linguistic areas (for adjective inflection, see Penke et al. 2004; Opitz et al. 2013, Opitz & Pechmann 2014). Previous approaches concerning case combinations in German relative clauses provide a description of the data and rely on the rules and constraints specific to these constructions.

The current thesis' approach utilizes universal, construction-independent principles corroborated by independent research. The subset principle and the specificity principle were implemented and transferring into preferences for case in German free relative clauses. It was shown that they can also account for most of the empirical findings of previous research (Bausewein 1991, Mewe 2014; Pittner 2003; Vogel & Frisch 2003; Vogel & Zugck 2003; Vogel, Frisch & Zugck 2006; Vogel 2011). Note, however, that the Subset Preference and the Specificity Preference appear to be violable as another preference, which is crucial for processing (discussed in Chapter 3.3. Deconstructing the subject notion), provides different preferences for the same language material.

2.3. Summary

Previous research concerning cases in German free relative clauses identified two preferences (or even rules in some approaches). First, the Case Match Preference was discussed (see Chapter 2.1.1. Case Match in free relative clauses). Case match was originally assumed to be the only possible construction for free relative clauses in German. According to the Case Match Preference, the case of the covert head in the matrix clause and the case of the relative pronoun must be identical (viz. they must match). This preference is corroborated by previous research as case match constructions were always judged significantly better and occur more often than mismatch constructions. Second, the Case Hierarchy Preference has been discussed (see Chapter 2.1.2. Case Hierarchy in free relative clauses). This preference distinguishes between two types of case mismatch constructions (i.e. constructions where the case of the covert head and the case of the relative pronoun are not identical). According to this preference, the case of the covert head must be higher on the case hierarchy (less marked) than the case of the relative pronoun. A construction obeying this preference is labelled as *hierarchy harmonic mismatch* and a construction not obeying this preference is labelled as *hierarchy opposing mismatch* in this thesis. Again, this preference is corroborated by previous research because hierarchy harmonic mismatch constructions were judged significantly better and occur more often than hierarchy opposing mismatch constructions (with one exception throughout research).

While the preferences above can describe the empirical data, they cannot explain them. They are construction-specific preferences and lack connection to independent research and recent inflection theories. In Chapter 2.2. (Morphosyntactic approach to case

in free relative clauses) this issue was addressed by an approach established in modern inflection theories: case decomposition into features. The advantage of decomposing cases into features is that the correct morphological form is derivable via universal principles rather than by construction-specific rules. Although previous research addresses morphological instantiation and markedness of cases, cases mostly remained abstract. In this thesis (see Chapter 2.2.3. Subset principle and specificity principle for case), the relevant cases were decomposed into features with the nominative as the case without features, the accusative with the feature [objective], and the dative with the features [objective] and [oblique]. In Chapter 2.2.4. (Implementing the principles in free relative clauses), it could be shown that the construction-specific Case Match Preference and the Case Hierarchy Preference can be replaced by the universal, construction-independent Specificity Preference and the Subset Preference, respectively. These preferences are based on two principles associated with feature decomposition: the specificity principle and the subset principle. The Subset Preference means for German free relative clauses that if the sets of case features of the covert head and the relative pronoun are not identical, the set of features of the case of the covert head is a subset of the set of features of the case of the relative pronoun. Hence, it subsumes the Case Hierarchy Preference. The Specificity Preference means for German free relative clauses that among all compatible sets of case features of the covert head within the context, the set with the highest specificity is chosen. Hence, it subsumes the Case Match Preference.

The novelty of this approach of the current thesis is to replace construction-specific preferences that describe the empirical data of German free relative clauses with construction-independent principles that explain the empirical findings. These preferences are based on general principles derived from theoretical (see Chapter 2.2.2. Feature decomposition of case) research and corroborated by independent experimental research (see Chapter 2.2.3. Subset principle and specificity principle for case). Importantly, as the term *preference* suggests, the Subset Preference and the Specificity Preference are only preferences, and thus, possibly violable.

Another issue raised in the introduction to this thesis (Chapter 1) but commonly neglected in previous research concerns the commonalities between free and headed relative clauses. The following chapter will, therefore, address preferences found in headed relative clauses.

3 Preferences in headed relative clauses

3.1. Parallel syntactic function in headed free relative clauses

Previous research on case phenomena in constructions with free relative clauses in German has mostly neglected commonalities they share with relative clauses with overt heads (= headed relative clauses). One remarkable trait they share is the preference for a parallel syntactic function (Parallel Syntactic Function Preference) of the nominal head and the relative pronoun. This preference has been observed in typological research for headed relative clauses (cf. Kirby 1998: 22; Newmeyer 2005: 181-2). Kirby reports a preference for the parallel syntactic function (subject/ object) in headed relative clauses. In this type of research, the respective syntactic function was usually tied to cases: nominative cases for subjects and objective cases for object.

This typological preference has been shown to be operative in several experimental studies. Ishizuka (2005) finds that in Japanese headed relative clauses case match conditions are read faster than case mismatch conditions in self-paced reading. The same was found by Levy et al. (2013) for Russian headed relative clauses. Fanselow et al. (1999) confirm the preference for case matches in German headed relative clauses in a reading time experiment, thereby revealing that case-ambiguous grammatical functions are preferentially assigned to the relative pronoun on the basis of the case borne by the head noun in German (see also Schlesewsky 1997[41] for similar findings, see below for a more detailed illustration and discussion).

The preference for case match in free relative clauses, as formulated in Chapter 2.1.1. (Case Match in free relative clauses) and Chapter 2.2. (Morphosyntactic approach to case in free relative clauses), can be viewed as a special case-based manifestation of this typological

[41] There are different notions for preferences concerning headed or free relative clauses to match, such as the parallel syntactic function approach (Kirby 1998), symmetry and asymmetry (as Schlesewsky 1997), or matching (Vogel 2011). They all refer to similar phenomena. For a related approach to account for the matching phenomenon in headed relative clauses centering around perspective taking, see MacWhinney (1977) and MacWhinney & Pléh (1988).

preference for headed relative clauses. This preference is formulated here for the convenience for covert and overt heads of free, respectively, headed relative clauses:

(3.1) The case of the covert / overt head matches the case of the relative pronoun in free / headed relative clauses.

Note that this is only a preference, not a rule, for headed and free relative clauses, as previous research shows (for research concerning German headed relative clauses with case-ambiguous heads and relative pronouns, see Fanselow et al. 1999, Schlesewsky 1997 amongst others; for research concerning German free relative clauses, see Mewe 2014, Vogel 2011; see also Chapter 2.1.1. Case match in free relative clauses).

Let us now consider experimental evidence for the Case Match Preference (established to be operative in free relative clauses) in headed relative clauses in German in more detail. Schlesewsky (1997) has examined case in German headed relative clauses in a self-paced reading study.[42] He reports that case matches between the (overt) head of the relative clause and the relative pronoun (which he calls *symmetry*) are read significantly faster than any case mismatches (which he calls *asymmetry*). Note that this study examines German headed relative clauses that are case-ambiguous concerning the head of the relative clause and the relative pronoun (accusative or dative) and only disambiguated later when encountering the verbs of the matrix clause and the relative clause. In Schlesewsky's study, the head of the relative clause is ambiguous; in free relative clauses it is covert. In both studies none of these antecedents are phonetically and syntactically clearly case marked. It is indeed remarkable to find a very similar mechanism in a construction so structurally highly similar to free relative clauses. It also provides further evidence that no construction- or language-dependent rules should be implemented specifically to account for case in free relative clauses. Rather, general, construction-independent preferences explaining previous data and data collected for the current thesis need to be used.

Recall that a preference for case match over case mismatch was explained in Chapter 2.2. (Morphosyntactic approach to case in free relative clauses): the Specificity Preference (a preference based on the specificity principle). It can be assumed that owing to several

[42] Find more details concerning self-paced reading in Chapter 5.1. (The self-paced reading paradigm).

structural similarities, the version presented in (1) applies to covert and overt heads of free, respectively, headed relative clauses (3.2):

(3.2) Specificity Preference:
In a context with multiple compatible morphological exponents, the morphological exponent with the highest specificity is chosen.

Applied to relative clauses with covert and overt heads this means that of all compatible sets of case features of the covert head with the context, the set with the highest specificity is chosen. This preference favors a case match over a case mismatch because the set of features of the case of the covert head is the most specific among all compatible sets for the context (because the set is identical to the required set of the context). This is line with research on German free relative clauses (cf. Vogel 2011, Mewe 2014 discussed in Chapter 2.2. Morphosyntactic approach to case in free relative clauses) and on headed relative clauses. For illustration, consider the examples with case match in (3.3; cases and features of the decomposed cases are provided in the examples.):

(3.3) Examples of case match in headed and free relative clauses with the cases nominative, accusative, and dative with case features for overt and covert head and relative pronouns

a. nominative match (mat-nomnom) in headed and free relative clauses

Keine Geduld besaß derjenige,		*der*	*den Sohn korrigiert hatte.*
no patience had	the-one$_{nom-[]}$	who$_{nom-[]}$	the son corrected had
Keine Geduld besaß	*___,*	*wer*	*den Sohn korrigiert hatte.*
no patience had	___$_{nom-[]}$	who$_{nom-[]}$	the son corrected had

'No patience had (the one) who had corrected the son.'

b. accusative match (mat-accacc) in headed and free relative clauses

Der Vater umarmte denjenigen,		*den*	*der Sohn korrigiert hatte.*
the father hugged	the-one$_{acc-[objective]}$	whom$_{acc-[objective]}$	the son corrected had
Der Vater umarmte	*___,*	*wen*	*der Sohn korrigiert hatte.*
the father hugged	___$_{acc-[objective]}$	whom$_{acc-[objective]}$	the son corrected had

'The father hugged (the one) who the son had corrected.'

c. dative match (mat-datdat) in headed and free relative clauses

Der Vater half demjenigen, dem

the father helped the-one$_{\text{dat-[objective], [oblique]}}$ whom$_{\text{dat-[objective], [oblique]}}$

der Sohn vertraut hatte.

the so trusted had

Der Vater half ___, wem

the father helped ___$_{\text{dat-[objective], [oblique]}}$ whom$_{\text{dat-[objective], [oblique]}}$

der Sohn vertraut hatte.

the son trusted had

'The father helped (the one) whom the son had trusted.'

The examples show that the adaptation of the Parallel Syntactic Function Preference onto case, specifically onto the morphosyntactic approach discussed for free relative clauses (see Chapter 2.2.4. Implementing the principle in free relative clauses) equally apply to headed and free relative clauses. It is irrelevant which cases are involved as long as a case match between (c)overt head and relative pronoun is provided (in 3.3a there is a nominative match; 3.3b shows an accusative match; and 3.3c shows a dative match). That is, it is irrelevant which sets of features are involved as long as the set of features of the case of the (c)overt head is the most specific of all compatible sets in relation to the set of features of the relative pronoun. Consequently, an identical set of features (i.e. case match) is preferred, as can be seen in examples given in (3.3) above. The cases and therefore the sets of features of (c)overt head and relative pronoun are always identical. This hints towards preferences relevant in headed relative clauses should be considered for free relative clauses as well.

To summarize, the Case Match Preference in headed relative clauses reveals that this condition is not parochial to free relative clauses. Its generality supports the conclusion presented in Chapter 2.2. Morphosyntactic approach to case in free relative clauses that morphosyntactic category, specifically case concurrence, is a more general, construction-independent phenomenon. The commonality between headed and free relative clauses may not end here. As known from previous research, there is a Subject Preference for relative pronouns that has been intensively investigated for headed relative clauses, starting with

the seminal paper of Keenan & Comrie (1977). The next chapter discusses this preference and explores the question whether it may also be operative in free relative clauses.

3.2. Subject Preference for relative pronouns in headed relative clauses

Another strategy found in headed relative clauses, which has hitherto been neglected in research concerning German free relative clauses, is the *Subject Preference* for the relative clause. This preference might be yet another commonality shared by free and headed relative clauses. Keenan & Comrie (1977) have found that the relativization of entities works along Accessibility Hierarchy (see (3.4), cf. 1977: 66):

(3.4) Accessibility Hierarchy:
subject > direct object > indirect object > other oblique arguments or modifiers

They found that cross-linguistically subjects are easier to extract than objects[43]. Traxler et al. (2002) have conducted an eye-tracking study investigating subject- and object-extracted relative clauses in English. The authors have conducted a three-part series of experiments to demonstrate which influences in subject- vs. object-extracted relative clauses elicit higher processing costs. The experiment presented below is the first of the series. Factors such as animacy or order-of-mention which Traxler et al. assumed to have an influence on processing are excluded by sticking to animate[44] referents for all NPs and by counter-balancing the test material in all possible orders-of-mention.[45] Thus, the effects found in this first experiment can distinctly be attributed to the relative ease with which subject- and object-extracted relative clauses are processed. The test material by Traxler et al. (2002: 73) is given in (3.5):

[43] Note that especially for direct and indirect objects, the results were not as conclusive as for the comparison between subject and objects generally.

[44] The following Chapter (Chapter 3.3 Deconstructing the subject notion) will highlight that the concept of agentivity is more appropriate than animacy (for a discussion on agentivity and animacy see also García García et al. 2018)

[45] See also Mak et al. (2002, 2006) showing that in Dutch, no difference in reading time occurs between subject and object relative clauses with inanimate referents.

(3.5) Test material for headed headed relative clauses of Traxler et al. (2002)

a. The lawyer that irritated the banker filed a hefty lawsuit. (subject-extracted)

b. The lawyer that the banker irritated filed a hefty lawsuit. (object-extracted)

c. The banker that irritated the lawyer played tennis every Sunday. (subject-extracted)

d. The banker that the lawyer irritated played tennis every Sunday. (object extracted)

The sentences in (3.5a and 3.5c) are subject-extracted relative clauses that were predicted to cause less processing costs than object-extracted relative clauses in (3.5b and 3.5d). The authors report shorter fixation times on the relative pronoun region for subject-extracted relative clauses vis-a-vis object-extracted relative clauses. They argue that this result is not surprising as it has already been shown in previous research (cf. Wanner & Maratsos 1978). They further argue that the results were expected due to numerous reasons as to why object-extracted relative clauses are more difficult to process than the subject-extracted relative ones. Their reasoning is much in line with Gibson's (1998) assumptions[46] toward subject- and object-extracted relative clauses. He states that

> [T]he object extraction is more complex by a number of measures including phoneme monitoring, on-line lexical decision, reading times, and response-accuracy to probe questions [...]. In addition, the volume of blood flow in the brain is greater in language areas for object-extractions than for subject-extractions [...], and aphasic stroke patients cannot reliably answer comprehension questions about object-extracted RCs, although they perform well on subject-extracted RCs [...]. (Gibson 1998: 2)

Other approaches focus on limited working memory and functions like activation, decay, and (ease of) retrieval of subject and object from working memory (see, among others, Jonides et al. 2008, Lewis et al. 2006). Despite the assumptions on why relative clauses with subject relative pronouns appear to be easier to process than relative clauses with object relative pronouns, the results are highly similar. This is true even though vastly different languages with differing structural configurations were examined (for Dutch see Frazier 1987, Mak et al. 2002, German: Mecklinger, Schriefers, Steinhauer & Friederici 1995, Schriefers, Friederici, & Kühn, 1995, Japanese and Korean: Miyamoto & Nakamura 2003, Ishizuka 2005, Kwon et al 2006, French and English: Ford 1983, Frauenfelder, Segui & Mehler 1980, Holmes & O'Regan, 1981, King & Just, 1991, King & Kutas, 1995, Traxler, Morris & Seely 2002). Numerous cross-

[46] Note, however, that both Traxler et al. (2002) and Gibson (1998) argue from a syntactic perspective. In fact, Traxler et. al. (2002) exclude the influence of animacy in their experiment. Gibson (1998) argues on a syntactic level as to why object-extrated relative clauses are more difficult to process and comprehend than subject-extracted relative clauses.

linguistic studies with various methods like comprehension tasks, eye-tracking, phoneme monitoring, and continuous lexical decision, and self-paced reading have consistently shown that object-extracting relative clauses are harder to process than subject-extracting relative clauses (e.g. Wanner & Maratsos 1978; Daneman & Carpenter 1980, Frauenfelder, Segui, and Mehler 1980; Ford 1983, Levy, Fedorenko & Gibson, 2013).[47] Thus, a Subject Preference for headed relative clauses can be formulated (see (3.6):

(3.6) Subject Preference for headed relative clauses:
Subject relative pronouns in headed relative clauses are preferred over object relative pronouns.

The vast majority of studies, however, have focused on languages with relatively rigid word order such as English (King & Just 1991), German (Konieczny 2000), Spanish (Betancort, Carreiras & Sturt 2009), and French (Cohen & Mehler 1996). The notion of *subject* and *object* was usually tied to cases (nominative for subjects; objective cases for objects) in previous empirical research concerning (headed) relative clauses.

Given the commonalities between headed and free relative clauses and the fact that the previously mentioned preference in Chapter 3.1 can be found in both constructions, it is plausible to hypothesize that the Subject Preference found in headed relative clauses is also operative in free relative clauses, as stated in (3.7):

(3.7) Subject Preference:
Subject relative pronouns in headed and free relative clauses are preferred over object relative pronouns.

According to the Subject Preference (3.7), all constructions with nominative subject relative pronouns are preferred over constructions with accusative or dative relative pronouns. Thus, nominative match (mat-nomnom), hierarchy opposing accusative-nominative mismatch (opp-accnom), and hierarchy opposing dative-nominative mismatch (opp-datnom) are preferred over accusative match (mat-accacc), dative match (mat-datdat), hierarchy harmonic nominative-accusative mismatch (har-nomacc), hierarchy harmonic nominative-

[47] Note that this is only true in studies with two animate referents.

dative mismatch (har-nomdat), hierarchy harmonic accusative-dative mismatch (har-accdat), and hierarchy opposing dative-accusative mismatch (opp-datacc). Consequently, the Subject Preference may conflict with the Subset Preference and the Specificity Preference (see Chapter 2.2. Morphosyntactic approach to case in free relative clauses).

A case in point is the hierarchy opposing accusative-nominative mismatch (opp-accnom) which was already discussed in Chapter 2.1.2. (Case Hierarchy Rule in free relative clauses). This constellation violates the Subset Preference (and, therefore, the Case Hierarchy Preference), but conforms to the Subject Preference for relative pronouns. This might explain the findings in Pittner (2003) and Mewe (2014). The Subject Preference (3.7) leads to additional preferences not covered by the Subset Preference or Specificity Preference. Specifically, it prefers the nominative match (mat-nomnom) over the accusative match (mat-accacc) and the dative match (mat-datdat), as mentioned above. Previous studies either neglected a comparison between different match conditions (Mewe 2014) or did not find any difference (Vogel 2011).

Despite their appeal, preferences formulated in terms of syntactic functions, specifically the Subject Preference and the Parallel Syntactic Function Preference, inherit the problems connected with these notions (cf. for an early criticism of the subject notion, Keenan 1976; for a recent critical review, Primus 2015). Therefore, the next chapter will take a closer look at the most important defining properties of the subject and object notion.

3.3. Deconstructing the subject: case, basic order, thematic role

Following Keenan (1976) and Primus (2015), the notions of subject and object can be defined, inter alia, in terms of case, structural position, or thematic role. Under the case view, subjects are associated with the nominative case and objects with the accusative, dative, or another oblique case in accusative languages like German and Latin.[48] Under the structural view, subjects precede objects in basic order. In terms of thematic roles, subjects are tied to a generalized agent notion and objects to a generalized patient notion (cf. e.g. Dowty 1991). Thus, *subject* and *object* are a cluster of different concepts.

[48] Since the focus of this thesis lies on German free relative clauses, only accusative languages will be considered here.

The above-mentioned associations between structural position, case, and thematic role for subject or object often apply. However, there is a cross-linguistically recurrent pattern where verbal arguments having structural subject properties do not bear the nominative case — a phenomenon that is known under the name of "quirky" subjects or "non-canonically case-marked subjects" (Aikhenvald et al. 2001, Bhaskararao & Subbarao 2004, Seržant & Kulikov 2013, Barðdal et al. 2018). This pattern is also attested in German, particularly with verbal arguments marked with dative case, cf. (3.8)–(3.10):

(3.8)

a. *Dem Chef* *gefällt* *der Clown.*
the-DAT boss pleases the-NOM clown
'The clown pleases the boss.'

b. *Dem Chef* *imponiert* *der Clown.*
the-DAT boss impresses the-NOM clown
'The clown impresses the boss.'

(3.9)

Dem Chef *gehört* *der Hund.*
the-DAT boss belongs-to the-NOM dog
'The dog belongs to the boss.'

(3.10)

a. *Dem Richter* *wurde* *der Antrag* *vorgelesen.*
the-DAT judge was the-NOM claim read-to
'The claim was read to the judge.'

b. *Dem Richter* *wurde* *der Antrag* *gegeben.*
the-DAT judge was the-NOM claim given-to
'The claim was given to the judge.'

(3.8a-b) exhibits psychological predicates (henceforth: psych verbs) with a dative experiencer, (3.9) a possession predicate with a dative possessor, and finally (3.10a-b), a passivized communication verb with a dative addressee and a passivized transfer of possession verb with a dative recipient. These dative verbal arguments accumulate a varying number of subject properties in different languages (cf. the contributions in Aikhenvald et al. 2001, Bhaskararao & Subbarao 2004, Seržant & Kulikov 2013, Barðdal et al. 2018). In German, their possibly only, but for the present thesis crucial subject property is that they precede the nominative co-argument in basic word order (cf. e.g. Lenerz 1977, Primus 1999, 2012), as shown in (3.8)–(3.10) above.

A plausible explanation for their preferred initial position is their agentive thematic role. This is congenially captured by Dowty's proto-role approach. Dowty defines two superordinate proto-roles, proto-agent and proto-patient, by bundles of entailments generated by the verb's meaning with respect to one of its arguments. The agent proto-role, which is of concern here, is characterized by the following five entailments (alternatively features) on part of the subject participant (1991: 571): (i) the participant does a volitional act, (ii) is sentient of or perceives another participant, (iii) causes an event or change of state in another participant, (iv) is moving autonomously, and (v) exists independent of the event named by the predicate. The list of properties in (i)–(v) is preliminary for Dowty: properties can be deleted or added without changing the logic of his approach. Additions include being in possession of another participant, following, among others, Wunderlich (1997).

Let us analyze the thematic role of the dative arguments in (3.8)–(3.10) in this framework. In (3.8a-c), we have experiencers with sentience as their only thematic property falling under the proto-agent; in (3.9), there is a possessor with possession as its only proto-agent feature. With passivized ditransitive verbs, the participant coded by the dative becomes sentient or starts to perceive the participant coded in the nominative, as in (3.10a), or it becomes a possessor of the participant coded in the nominative, as in (3.10b). Summing up, in all instances, a dative argument with proto-agent properties precedes a co-argument without any proto-agent properties in basic order concerning thematic roles in German.[49] The possibly universal, yet violable, generalization that explains this basic order pattern is given in (3.11, cf. Bader & Häussler 2010, Felser 2015, Tomlin 1986, Primus 1999, 2012).

(3.11) Proto-Agent First Preference:

Proto-agents precede proto-patient co-arguments in basic word order.

Note that this is only a preference. A proto-patient may precede a proto-agent due to discourse constraints, e.g. if it is more topical than the proto-agent co-argument.

Summing up, German has two types of constructions with dative arguments. In the type discussed above, a dative experiencer (DatExp for short) or a dative possessor precedes

[49] This clear asymmetry between a proto-agent and a proto-patient interpretation of a verb's co-arguments only holds for dative marked possessors or experiencers. In the pattern with an accusative experiencer or possessor, the nominative argument may be interpreted as a causer of the event. In this interpretation, the nominative argument is more agentive than the accusative experiencer or possessor, and hence, the former preferably precedes the latter (cf. e.g. Bornkessel et al. (2003)).

the nominative co-argument in basic order. This was explained by the fact that experiencers or possessors are proto-agents and that a proto-agent precedes a proto-patient co-argument in basic order. In another type of construction selected by verbs like *helfen* (help), *antworten* (answer), and *folgen* (follow), the dative argument is causally affected and hence a proto-patient (DatPat for short), while the nominative argument is a volitional causer. Hence, in this pattern, the nominative argument precedes the dative argument in basic order in accordance with the same Proto-Agent First Preference. Importantly, accusatives can never occur sentence initially in basic word order concerning thematic roles. Thus, initial accusatives always violate the Proto-Agent First Preference.

The Proto-Agent First Preference is corroborated for dative experiencers by neurophysiological data in Bornkessel et al. (2003). Bornkessel et al. (2003) have used the ERP method to understand the time course of language processing, specifically crucial for the concerns of this thesis, and explored how the human language processing system interprets an unambiguously dative marked argument without knowing the type of verb (DatPat or DatExp). They used transitive verb-final sentences with unambiguously case-marked arguments of the two types discussed above (DatPat and DatExp) and manipulated the word order (nominative-dative and dative-nominative, respectively). Verb-final structures were chosen to ensure that the verb does not provide any cues as to how the arguments are to be interpreted in terms of thematic roles. Consider the test material of Bornkessel et al. (2003: 279/80) in (3.12):

(3.12) *Maria glaubt...*
Maria believes...

a. DatPat (NOM-DAT order)

dass	*der Priester*	*dem Gärtner*	*folgt und...*
that	the-NOM priest	the-DAT gardener	follows and...

'that the priest is following the gardener and...'

b. DatExp (NOM-DAT order)

dass	*der Priester*	*dem Gärtner*	*imponiert und...*
that	the-NOM priest	the-DAT gardener	impresses and...

'that the priest impresses the gardener and...'

c. DatPat (DAT-NOM order)

dass	*<u>dem Priester</u>*	*der Gärtner*	*folgt und...*
that	the-DAT priest	the-NOM gardener	follows and...

'that the gardener is following the priest and...'

d. ObjExp (DAT-NOM order)

dass	*<u>dem Priester</u>*	*der Gärtner*	*imponiert und...*
that	the-DAT priest	the-NOM gardener	impresses and...

'that the gardener impresses the priest and...'

Bornkessel et al. (2003) have measured event-related brain potentials (ERPs) in their experiment, where they compared initial nominative arguments to initial dative arguments. ERPs are time-locked multidimensional measurements of brain activity when encountering a critical stimulus. Potential changes in the electroencephalogram (EEG) are measured to examine the electrophysiological response of the brain to a stimulus. They "consist of a series of negative and positive potential changes relative to critical stimulus onset [..., and] can be classified with respect to a number of parameters: latency, polarity, topography and amplitude" (Bornkessel et al. 2003: 272). These parameters are used to classify the ERP effects into components, such as N400 (for a detailed discussion of the N400, see Kutas and Hillyard 1980, Kutas and Federmeier 2000; for a discussion of different components, see Bornkessel-Schlesewsky and Schlesewsky 2009: 7, 10; see also Bornkessel-Schlesewsky & Schumacher 2016, Schumacher & Hung 2012). An N400 means that there is a negativity (hence, N) around 400 ms after the onset of the critical stimulus. Crucially, for the topic of the current thesis, the N400 is associated with thematic roles and relations between the thematic roles within a sentence (cf. Frisch & Schlesewsky 2001). Note that the components, including N400, are always measured relative to a control condition and never in absolute terms. The incremental nature, the multidimensional measurements of the brain's response to a stimulus, and the component linked to specific processing tasks make the ERP method very suitable to test incremental sentence interpretation.

The human processor interprets incoming language material, including thematic roles, immediately (beim Graben, Saddy, Schlesewsky & Kurths 2000, Crocker 1994, Bornkessel-

Schlesewsky and Schlesewsky 2009: 89−94, among others). Crocker captured the incrementality as a basic characteristic of the human processor in his Principle of Incremental Processing (PIC, see (3.13), Crocker 1994: 251):

(3.13) Principle of Incremental Comprehension (PIC):
The sentence processor operates in such a way as to maximize the interpretation and comprehension of the sentence at each stage of processing (i.e. as each lexical item is encountered).

The PIC entails that the human processor does not wait until the end of a sentence, also in the case of verbal arguments preceding the verb in the clause. With each lexical input entering the sentence, interpretation continues and maximizing the interpretation is targeted. Of major concern for this thesis is the incremental processing of the clause initial nominative or dative argument underlined for convenience in (3.12a-d) above.

Bornkessel et al. (2003) have hypothesized that initial dative arguments may not elicit a processing difficulty (i.e. N400) vis-a-vis initial nominative arguments. Their explanation is that the human parser adheres to the Proto-Agent First Preference when encountering an initial dative argument. Since before encountering the verb, both nominative and dative arguments may be interpreted as proto-agents in German. At the position of the first noun phrase, both nominative and dative arguments can be interpreted as proto-agents. Verbal information on the dative arguments (whether they are DatPat or DatExp) has not been provided yet. Therefore, they do not contradict the agent-first assumption at the position of the first noun phrase. As discussed above, none of the four patterns presented in (3.12a-d) do not contradict the agent-first assumption at the position of the first noun phrase.

They further argue that though Rösler et al. (1998) processing differences occurred in their ERP study with scrambled non-pronominal dative arguments, they do not expept the same results due to the different kinds of constructions they chose. Rösler et al. (1998) examined arguments in German main clauses following an auxiliary in second position. This means that when encountering the dative argument, the verb provides crucial information for the the parser already to know that the argument was scrambled. By contrast, Bornkessel et al. (2003) examined arguments in German embedded clauses where the verb occurs only at the end of the sentence (see also 3.10). Therefore, no information provided by the verb are accessible to the parser before encountering it. Importantly, in German

passive constructions dative arguments may occur sentence initially in basic word order. Bornkessel et al. (2003) argue that as a consequence of this fact combined with the usage of embedded clauses, they do not expect dative arguments to elicit processing difficulty vis-a-vis initial nominative arguments. Importantly, initial accusative arguments never occur sentence initially (including in embedded clauses) in German passive constructions.

Their experimental results corroborated their prediction: They found no processing differences between nominative and dative arguments in the initial sentence position. Crucially, in another experiment, Bornkessel et al. (2002) have compared pairwise nominative versus accusative and nominative versus dative initial arguments. They found an N400 at the position of the accusative sentence initial argument vis-a-vis the nominative sentence initial argument. In addition, there was no N400 at the position of the dative sentence initial argument vis-a-vis the nominative sentence initial argument, as in the experiment conducted by Bornkessel et al. (2003). There was, however, a positivity effect (P600) on the clause-final verb for contexts with patient-like datives (DatPat). They interpret this as a reanalysis effect caused by the correction of the initial interpretation of the dative argument as a proto-agent by the parser.

Summing up, accusative initial arguments elicited a processing disadvantage because they are proto-patients that cannot adhere to the Proto-Agent First Preference. In contrast, dative initial arguments were equal to nominative initial arguments in eliciting no processing costs. The reason is that both can be interpreted as proto-agents so that such structures do not contradict the Proto-Agent First Preference at the position of the first noun phrase.[50]

The neurophysiological experiments mentioned above provide evidence that incremental processing in terms of verb-final sentences does not elicit increased processing when faced with an initial dative-arguments compared to an initial nominative-argument. It is not only nominative arguments, strongly associated with the structural position of subjects, that can occur sentence initially in basic word order. Dative arguments, associated with the structural position of objects, may be interpreted as experiencers (due to psych verbs) and therefore also occur sentence initially in basic word order (see 3.8-9). Further, possessors in passive constructions (see 3.10) can also occur sentence initially.

[50] This conclusion is corroborated by Bornkessel et al.'s finding of a thematic reanalysis positivity at the position of the nominative argument following the clause-initial dative.

Importantly, for the current thesis, the findings of Bornkessel et al. (2003) and Bornkessel et al. (2002) may be transferred to the processing of free relative clauses. First, the method used by Bornkessel et al. (2003) is an online—i.e. time-sensitive—method, which is well suited to measure incremental processing. While the method of the current thesis (self-paced reading) and the EEG method used by Bornkessel et al. (2003) and Bornkessel et al. (2002) differ, they are time-sensitive and capable of measuring incremental processing. Bornkessel et al. (2003) and Bornkessel et al. (2002) do not report a difference between initial nominative and dative arguments. Therefore, similar results can be expected for the processing of relative pronouns for the following reasons.

Bornkessel et al. (2003) and Bornkessel et al. (2002) have examined a full noun phrase, while the current thesis tests a relative pronoun. The commonality they share is that both are arguments of the verb, they are unambiguously case-marked, and they occur initially in terms of verb-final sentences. This means that in all these studies the initial argument is interpreted in terms of thematic roles with the unambiguous case being the only cue to role interpretation. As discussed above, dative and nominative cue as a proto-agent, while accusative cues as a proto-patient. This suggests that at the position of the relative pronoun, no difference between dative and nominative is expected in this thesis' experiments, while accusative relative pronouns are expected to elicit a higher processing cost in terms of reading times vis-a-vis nominative or dative relative pronouns. This would fit well with the findings of Bornkessel et al. (2003) and Bornkessel et al. (2002).

Note that all the dative relative pronouns in the experimental material of this thesis are neither experiencers nor possessors. However, due to the nature of the method of self-paced reading, the participants are not aware of this when encountering the relative pronouns as sentence continuation and the type of verb was unknown to them. Hence, the Proto-Agent First Preference can be held for dative relative pronouns at this point. Only at the end of the sentence when encountering the verb, the parser notices that the initial interpretation of a dative relative pronoun as a possessor or experiencer was false.

Let us first consider the impact of the Proto-Agent First Preference before encountering the verb, see (3.14):

(3.14)

mat-nomnom, mat-datdat, har-nomdat, har-accdat, opp-accnom, and opp-datnom are equally preferred over

mat-accacc, har-nomacc, and opp-datacc

Constructions with a nominative and dative relative pronoun (mat-nomnom, mat-datdat, har-nomdat, har-accdat, opp-accnom, and opp-datnom) are preferred over constructions with accusative relative pronouns (mat-accacc, har-nomacc, and opp-datacc) because the first are interpreted as proto-agents, whereas the latter can only be interpreted as proto-patients. That is, constructions with nominative and dative relative pronouns obey the Proto-Agent First Preference, while constructions with accusative relative pronouns do not. Therefore, constructions with nominative and dative relative pronouns are equally preferred over constructions with accusative relative pronouns before encountering the critical verb.

Let us now consider the impact of the Proto-Agent First Preference after encountering the verb. Until encountering the critical verb, dative relative pronouns are interpreted as proto-agents. However, when the critical verb does not license proto-agent datives but patient-like datives, preferences between constructions change. Constructions with patient-like dative relative pronouns apparently do not obey the Proto-Agent First Preference and therefore are dispreferred against constructions with nominative relative pronouns. Consequently, after encountering the critical verb, the Proto-Agent First Preference favors constructions with a nominative relative pronoun (mat-nomnom, opp-accnom, opp-datnom) over constructions with an accusative or dative relative pronoun (mat-accacc, mat-datdat, har-nomacc, har-nomdat, har-accdat, opp-datacc), as illustrated in (3.15):

(3.15)

mat-nomnom, opp-accnom, opp-datnom

are equally preferred over

mat-accacc, mat-datdat, har-nomacc, har-nomdat, har-accdat, opp-datacc

This is why proto-agent datives may occur in initial sentence positions in basic word order. Bornkessel et al. (2002, 2003) prove this by showing in their ERP studies that the initial

dative does not elicit increased processing costs on the dative arguments vis-a-vis nominative arguments, which are almost always proto-agents when occurring sentence initially in incremental processing, irrespective of whether the initial dative was, in fact, a proto-agent or patient-like.[51]

3.4. Summary

The introduction (Chapter 1) already addressed the issue of commonalities between free and headed relative clauses which have often been neglected in previous research. This chapter discussed the preferences established for headed relative clauses and showed that they also apply to free relative clauses, only with slight adjustments.

First, the Parallel Syntactic Function Preference for headed relative clauses (Chapter 3.1. Parallel syntactic function in headed relative clauses) was discussed. This preference was originally formulated for headed relative clauses on a typological background, but shown to indeed be operative in empirical studies in various languages. According to this preference, the (overt) head in the matrix clause and the relative pronoun should be parallel concerning their syntactic function. The syntactic function was usually tied to case. This is especially crucial for German since there are two cases (accusative and dative) commonly associated with the syntactic function *object*. Thus, this preference can rather be regarded as a special case-based manifestation of this typological preference for headed relative clauses, much like the Case Match Preference discussed for free relative clauses in Chapter 2.1. (Case match in free relative clauses). The Case Match Preference in headed relative clauses reveals that this condition is not parochial to free relative clauses. Its generality further supports the conclusion presented in Chapter 2.2. (Morphosyntactic approach to case in free relative clauses) that morphosyntactic category, specifically case concurrence, is a more general, construction-independent phenomenon where a preference for match can be explained by the construction-independent Specificity Preference.

Second, the Subject Preference for headed relative clauses (Chapter 3.2. Subject Preference for relative pronouns in headed relative clauses) has been discussed. This preference is based on the Accessibility Hierarchy (Keenan & Comrie 1977) which states that

[51] Recall from Chapter 3.3. (Deconstructing the subject notion) that in case initial dative were patient-like, reanalysis effects occur later in the sentence when it becomes apparent that the initial proto-agent interpretation of the dative was incorrect.

cross-linguistically subjects are easier to extract that objects. This typological research is corroborated by numerous empirical studies with various methods in many languages. However, this preference (as well as the Parallel Syntactic Function Preference above) inherit the problems connected with notions in terms of syntactic functions. The notion of *subject* and *object* is equivocal, which is crucial for the topic of the current thesis. This issue was addressed in Chapter 3.3. (Deconstructing the subject notion). It was argued that structural subject properties do not always bear nominative case. Specifically, it was shown how dative arguments may have subject properties due to their agentive thematic role (i.e. experiencer and possessor) based on Dowty's (1991) proto-role approach. Therefore, dative arguments with an agentive role may occur sentence initially in basic word order. This structural position is not limited to nominative arguments in basic word order. Consequently, the general, construction-independent Proto-Agent First Preference was formulated which states that proto-agents precede proto-patient co-arguments in basic word order. Crucially, accusative arguments as proto-patients can never occur sentence initially in basic word order. The Proto-Agent First Preference is corroborated by research (Bornkessel et al. 2002, 2003) using an online method. It was shown that initial dative arguments do not elicit increased processing costs vis-a-vis initial nominative arguments because they are interpreted as proto-agents in basic word order. Only later in the sentence when the verb is revealed and the parser is provided with evidence against the initial proto-agent interpretation of the dative argument, higher processing costs are elicited vis-a-vis nominative arguments. Although this research is not concerned with headed vs. free relative clauses, it was argued that the implications of this universal preference will apply to the topic of the current thesis. That is, initial dative relative pronouns are expected not to elicit higher processing costs vis-a-vis nominative relative pronouns because they may be interpreted as proto-agents. Only when conflicting evidence enters the discourse, this interpretation turns out to be false and increased processing costs occur.

This part of the thesis revealed that preferences found in headed relative clauses can be found in free relative clauses as well. Owing to more recent findings in research and the method of the study in the current thesis, minor adjustments are needed to be implemented. However, it is apparent that the commonalities between free and headed relative clauses are reflected in very similar preferences operative in these constructions. This supports the approach, pursued in Chapter 2.2. (Morphosyntactic approach to case in free relative

clauses), of replacing construction-specific preferences (or even rules) formulated in previous research with universal, construction-independent preferences.

Summing up the preceding chapters, three construction-independent, possibly universal, violable preferences have been postulated. The Subset Preference (based on the subset principle) was introduced to explain Pittner's construction-dependent Case Hierarchy Rule (see Chapter 2.1), as discussed in Chapter 2.2. The Specificity Preference (specificity principle) is meant to explain case match and its advantage over case mismatch, including an advantage over mismatches obeying the Case Hierarchy Rule (harmonic mismatches). The Proto-Agent First Preference is meant to replace the construction-dependent Subject Preference for relative pronouns and to explain incremental processing effects, as discussed in this section.

The next part will resume crucial discernments concerning case in free relative clauses before turning to the experimental studies of this thesis. It will first provide a comparison of the preferences (Subset Preference, Specificity Preference, Proto-Agent First Preference) in free and headed relative clauses, clearly outlining their commonalities to support the approach of construction-independent, rather than construction-specific, preferences operative in free relative clauses.

Further, the violability of all three postulated preferences operative in free relative clauses will be addressed. This will be achieved by providing language material similar to the experimental material used in this thesis in tables. It will be shown which preference prefers which constructions of others. As will be shown, not all preferences can be satisfied simultaneously. Optimality Theory will then be introduced as a powerful tool to model these conflicting preferences.

4 Modeling the preferences for free relative clauses

4.1. Recapitulation of preferences for free and headed relative clauses

In Chapter 2 of this thesis, preferences concerning case match (Chapter 2.1.1. Case Match in free relative clauses and Chapter 2.2. Morphosyntactic approach to case in free relative clauses) and case mismatch (Chapter 2.1.2. Case Hierarchy Rule in free relative clauses and chapter 2.2. Morphosyntactic approach to case in free relative clauses) in German free relative clauses were discussed and explained. Specifically, two crucial findings emerged from this part of this thesis. First, the preferences identified to operate in German free relative clauses are not construction-specific (see Chapter 2.2. Morphosyntactic approach to case in free relative clauses). Rather, they are more general, construction-independent preferences. Second, similar preferences to the ones operative in free relative clauses were assumed to be operative in headed relative clauses. This assumption was supported by Chapter 3 of this thesis. This part focused on the preferences established to be operative in headed relative clauses (Chapter 3.1. Parallel syntactic function in headed relative clauses and Chapter 3.2. Subject Preference for relative pronouns in headed relative clauses) and highlighted how they may be applicable and fit the general, construction-independent preferences postulated for free relative clauses in Chapter 1.

In this chapter, I summarize the results of the first two parts of this thesis by comparing the preferences postulated for free and headed relative clauses. It will be shown that they are highly similar. Thus, construction-specific rules to explain data for German free relative clauses can be replaced by general, construction-independent preferences that have already shown to be applicable to headed relative clauses in a very similar way. Recall from Chapter 1.2. (What are free relative clauses) that free and headed relative clauses share

numerous similarities. Finding similar preferences operative in both constructions is, although mostly neglected in previous research, not very surprising.

Let us first recapitulate the preferences found (or assumed) to be operative in headed and free relative clauses in (4.1)

(4.1) Comparison between preferences in headed and free relative clauses

headed relative clauses	**free relative clauses**
Parallel Syntactic Function Preference	Specificity Preference
?[52]	Subset Preference
Subject Preference (offline method)	Proto-Agent First Preference[53] (online method)

The preference for parallel syntactic functions between the head of the relative clause and the relative pronoun has been observed in typological research on headed relative clauses (Kirby 1998: 22, Newmeyer 2005: 181-2). Kirby reports a preference for parallel syntactic function (subject/ object) in headed relative clauses. In this type of research, the syntactic function was usually tied to the case: nominative cases for subjects and objective cases for object. Some studies, including studies with German test material (Fanselow et al. 1999, Schlesewsky 1997), suggest that objective cases cannot be summarized and are needed to be considered in more detail. Thus, instead of a mere Parallel Syntactic Function Preference, there appears to be a preference for case match.

The preference for case match in free relative clauses, as formulated in Chapter 2.1.1. (Case Match in free relative clauses) and Chapter 2.2. (Morphosyntactic approach to case in free relative clauses) can be viewed as a special case-based manifestation of this typological preference for headed relative clauses.

This special case-based manifestation of the Parallel Syntactic Function Preference identified to operate in headed relative clauses has been shown to be operative in German free relative clauses. Research concerning case in German free relative clauses repeatedly

[52] There is no explicit preference for headed relative clauses established in the literature concerning the mismatch cases of the overt head and the relative pronoun. Thus, no equivalent to the Subset Preference postulated to be operative in free relative clauses can be named here. There is, however, evidence for a case hierarchy preference in German headed relative clauses, as already discussed in Chapter 2.1.2. (Case Hierarchy Rule in free relative clauses), by self-paced reading studies on case is headed relative clauses by Schlesewsky (1997).

[53] Note that while the Subset Preference and the Specificity Preference are corroborated by previous research concerning German free relative clauses, the Proto-Agent First Preference was never examined concerning German free relative clauses and thus, is not corroborated by research regarding these constructions.

showed case match constructions to be more acceptable and to occur more often in corpora than any case mismatch construction (cf. Mewe 2014, Vogel & Frisch 2003, Vogel & Zugck 2003, Vogel, Frisch & Zugck 2006, Vogel 2011). The preference for case match in free relative clauses has been approached by decomposing the cases of the covert head and the relative pronoun of free relative clause constructions into features, as established in modern inflection theories (see Chapter 2.2. Morphosyntactic approach to case in free relative clauses). The principle that explains why case matches are preferred over case mismatches is the specificity principle. All case match constructions obey this principle because the set of features of the case of the covert head (henceforth: $case_{matrix}$) and the set of features of the case of the relative pronoun (henceforth: $case_{relative}$) are identical, making $case_{matrix}$ the most specific of all compatible forms. Thus, the Specificity Preference was formulated for free relative clauses in Chapter 2.2.4. (Implementing the principles in free relative clauses).

The Parallel Syntactic Function Preference was shown to need modification concerning cases as language with multiple objective cases, including German, may distinguish between them even when their syntactic functions as objects are the same. A preference for case match in headed relative clauses could be derived from that. The same preference can also be found in free relative clauses. Thus, the commonalities between headed and free relative clauses result in the same preferences. Chapter 2.2. (Morphosyntactic approach to case in free relative clauses) added case match modifications to adequately explain why this is the case using case features which offer a general, construction-independent explanation. However, this does not change the fact that similar preferences were identified for both constructions.

The Subset Preference identified for free relative clauses is meant to replace the construction-dependent Case Hierarchy Preference of previous research. This preference could only describe the data, but it could not explain them. The Subset Preference is based on the subset principle. The subset principle uses features of decomposed cases, just like the specificity principle. For constructions with free relative clauses to obey the Subset Preference, the set of features of $case_{matrix}$ must be a subset of the set of features of $case_{relative}$. This preference can account for the fact that hierarchy harmonic case mismatches were repeatedly found to be judged more acceptable in acceptability studies and to occur more often in corpus studies than hierarchy opposing case mismatches (cf. Bausewein 1991,

Mewe 2014; Pittner 2003; Vogel & Frisch 2003; Vogel & Zugck 2003; Vogel, Frisch & Zugck 2006; Vogel 2011).

Although there is no specific equivalent preference concerning headed relative clauses, there is evidence that the case hierarchy is operative in headed relative clauses.[54] As mentioned in Chapter 2.1.2. (Case Hierarchy Rule in free relative clauses), Schlesewsky (1997) finds the case hierarchy (which the Case Hierarchy Preference is based on) to be operative in headed relative clauses in his self-paced reading study. Thus, while there is no specific established preference for the case hierarchy to apply to headed relative clauses, there is evidence that, in fact, it does.

As mentioned above, the Subset Preference is meant to replace the Case Hierarchy Preference for German free relative clauses as it provides an explanation for data on the basis of a general, construction-independent principle established in modern inflection theories. Another preference found for relative pronouns in headed relative clauses is the Subject Preference (Keenan & Comrie (1977) based on the Accessibility Hierarchy. Keenan & Comrie (1977) have found that cross-linguistically subjects are easier to extract than objects.

Numerous cross-linguistic studies, including studies with German language material (Mecklinger, Schriefers, Steinhauer & Friederici 1995, Schriefers, Friederici & Kühn 1995), with various methods like comprehension tasks, eye-tracking, phoneme monitoring, and continuous lexical decision and self-paced reading have consistently supported the assumption that object-extracting relative clauses are harder to process than subject-extracting relative clauses. However, the notion of *subject* and *object* is equivocal. Following Keenan (1976) and Primus (2015), the notions of *subject* and *object* can be defined, inter alia, in terms of case, structural position, or thematic role. Therefore, the notions of *subject* and *object* need to be decomposed (see Chapter 3.3. Deconstructing the subject notion). The dative combines the characteristics of subject (due to thematic roles dative arguments may code) and object. This is why proto-agent datives may occur in initial sentence positions in basic word order. Bornkessel et al. (2002, 2003) prove this by showing in their ERP studies that the initial dative does not elicit increased processing costs on the dative arguments vis-a-vis nominative arguments (which are almost always proto-agents) when occurring sentence initially in incremental processing, irrespective of whether the initial dative was, in

[54] Recall that the Case Hierarchy Rule is based on the case hierarchy and this thesis replaced the Case Hierarchy Rule with the universal Subset Preference.

fact, a proto-agent or patient-like.[55] As a consequence, the Subject Preference, a strategy mainly targeted toward the grammatical subject vs. object and inspired by previous research (cf. Keenan & Comrie, 1977; Sheldon, 1974; MacWhinney & Pléh, 1988), is inappropriate for German online data, as it would not distinguish the dative match from the accusative match unequivocally. Hence, the Subject Preference identified in previous research concerning headed relative clauses is replaced by the more expedient Proto-Agent First Preference for incremental processing of free relative clauses. While there is no evidence for this preference to be operative in German free relative clauses in previous research because they were not examined with an online method, the Proto-Agent First Preference can be strongly assumed to be operative in processing of free relative clauses because, as the preferences discussed before in this chapter, the Proto-Agent First Preference is a general, construction-independent preference. Yet again, a preference identified for headed relative clauses seems to apply to free relative clauses in a similar way. Note that the adjustments from the Subject Preference in headed relative clauses to the Proto-Agent First Preference are necessary as the current thesis used an online method and the fact that the notions of *subject* and *object* are equivocal in many languages, including German.

To summarize, all three preferences postulated for German free relative clauses in this thesis are general and construction-independent. They have also been shown to be operative in very similar ways in constructions with headed relative clauses that share many commonalities with free relative clauses. However, these three preferences are shown or strongly assumed to apply to German free relative clauses may conflict with each other. The following chapter 4.2. (Conflicting preferences in free relative clauses) provides an overview and explanations of how their preference profiles conflict concerning German free relative clause constructions. The chapter after that (4.3. Introduction to Optimality Theory) offers a solution to handle these conflicting preference profiles.

4.2. Conflicting preferences in free relative clauses

The approach of the current thesis incorporates construction-independent preferences discussed in detail in Chapter 2.2.4. (Implementing the principles to free relative clauses)

[55] Recall from Chapter 3.3. (Deconstructing the subject notion) that in case initial dative were patient-like, reanalysis effects occur later in the sentence when it becomes apparent that the initial proto-agent interpretation of the dative was incorrect.

and Chapter 3.3. (Deconstructing the subject notion) to account for case in German free relative clauses. It is assumed that the three identified preferences, that is, the Subset Preference, the Specificity Preference, and the Proto-Agent First Preference, can explain case phenomena in German free relative clauses.

The Subset Preference (based on the subset principle) was introduced to replace the construction-dependent Case Hierarchy Preference (see Chapter 2.1.2. Case Hierarchy Rule in free relative clauses), as discussed in Chapter 2.2.4. (Implementing the principles to free relative clauses). The Specificity Preference (based on the specificity principle) is meant to explain case match and its advantage over case mismatch (see Chapters 2.1.1. Case Match in free relative clauses and 2.2. Morphosyntactic approach to case in free relative clauses), including an advantage over mismatches obeying the Case Hierarchy Preference (harmonic mismatches). The Proto-Agent First Preference is meant to replace the construction-dependent Subject Preference for relative pronouns and to explain incremental processing effects. For convenience, these preferences are provided below in (4.2)–(4.4), again:

(4.2) Subset Preference:
A morphological exponent, M, is compatible with a syntactic context, S, if M realizes a (proper or improper) subset of the morphosyntactic feature set of S.

(4.3) Specificity Preference:
In a context with multiple compatible morphological exponents, the morphological exponent with the highest specificity is chosen.

(4.4) Proto-Agent First Preference:
Proto-agents precede proto-patient co-arguments in basic word order.

All these general, construction-independent preferences were shown to be operative in German free relative clauses (Subset Preference and Specificity Preference) or can be assumed to be operative (Proto-Agent First Preference) in German free relative clauses. However, each preference prefers different free relative clause constructions over others. This chapter will contrast these different preference profiles for each case combination. It will be shown that the three conflicting preferences cannot be satisfied simultaneously. Therefore, an interaction of the three preferences must be assumed.

Let us now consider German free relative clause construction and the preferences identified to be applicable for them in this thesis. We will illustrate the applicability of the preferences in tables, one per combination of cases, that share a common basic layout. The very first column contains the specific kind of construction, together with an example sentence. The second, third, and fourth column contain the three universal, construction-independent preferences identified to be operative in German free relative clauses. When a construction obeys the preferences at hand, it is indicated by a tick (√). When a construction violates the preference, the box is left blank. Within one column, constructions with a tick are equally preferred over constructions without a tick. It is possible for all, some, or no constructions to have a tick within one column. In case all or no ticks occur in one column, no construction is preferred over another.

First, consider free relative clauses with the nominative and accusative cases in (4.5):

(4.5) German free relative clause constructions with the nominative and accusative cases

Construction	**Subset Preference**	**Specificity Preference**	**Proto-Agent First Preference**
a. nominative match (mat-nomnom): *Keine Geduld besaß* ___, *wer* no patience had ___$_{nom}$ who$_{nom}$ *den Sohn korrigiert hatte.* the son corrected had 'No patience had who had corrected the son.'	√	√	√
b. accusative match (mat-accacc): *Der Vater umarmte* ___, *wen* the father hugged ___$_{acc}$ whom$_{acc}$ *der Sohn korrigiert hatte.* the son corrected had 'The father hugged who the son had corrected.'	√	√	
c. hierarchy harmonic nominative-accusative mismatch (har-nomacc): *Keine Geduld besaß* ___, *wen* no patience had ___$_{nom}$ whom$_{acc}$ *der Sohn korrigiert hatte.* the son corrected had 'No patience had whom the son had corrected.'	√		

d. hierarchy opposing accusative-nominative mismatch (opp-accnom): *Der Vater umarme ___, wer* the father hugged ___$_{acc}$ who$_{nom}$ *den Sohn korrigiert hatte.* the son corrected had 'The father hugged who had corrected the son.'			√

Let us begin with the second column: the Subset Preference. All match constructions, including both match constructions in (4.5a and b, mat-nomnom and mat-accacc), obey this preference as the set of features of the case of their covert heads (henceforth: $case_{matrix}$) is a(n improper) subset of the set of features of the case of the relative pronoun (henceforth: $case_{relative}$). This is indicated by the tick (√). The hierarchy harmonic nominative accusative mismatch (4.5c har-nomacc) also obeys this preference because the set of features of $case_{matrix}$ is a (proper) subset of the set of features of $case_{relative}$. The only free relative clause construction with nominative and accusative cases which violates this preference is the hierarchy opposing accusative-nominative mismatch (4.5d opp-accnom). This is because the set of features of $case_{matrix}$ is not a (proper) subset of the set of features of $case_{relative}$ but rather vice versa. Taken together, according to the Subset Preference, nominative match (mat-nomnom), accusative match (mat-accacc), and hierarchy harmonic nominative-accusative mismatch (har-nomacc) are equally preferred over the hierarchy opposing accusative-nominative mismatch (opp-accnom).

Let us now turn to the Specificity Preference in the third column. According to this preference, the most specific of all compatible exponents for the current context is chosen. As none of the case mismatches is the set of features of $case_{matrix}$, the most specific exponent of all compatible exponents stands in relation to the set of features of $case_{relative}$. The most specific exponent are identical cases which is only given in case matches. Thus, this preference is only obeyed by match constructions, i.e. the nominative match (4.5a mat-nomnom) and the accusative match (4.5b mat-accacc). Consequently, the nominative match (4.5a mat-nomnom) and the accusative match (4.5b mat-accacc) are equally preferred over the harmonic nominative-accusative mismatch (4.5c har-nomacc) and the opposing accusative-nominative mismatch (4.5d opp-accnom).

Let us now consider the Proto-Agent First Preference in the fourth column. According to this preference, the nominative match (4.5a mat-nomnom) and the opposing accusative-

nominative mismatch (4.5d opp-accnom) are preferred over the accusative match (4.5b mat-accacc) and the harmonic nominative-accusative mismatch (4.5c har-nomacc). This is because a nominative relative pronoun may code a proto-agent and can therefore occur sentence initially in basic word order, while an accusative relative pronoun cannot be a proto-agent (rather proto-patient) and thus cannot occur sentence initially in basic word order.

To summarize, the Subset Preference disprefers the opposing accusative-nominative mismatch against the other three constructions; the Specificity Preference prefers case match over case mismatch; the Proto-Agent First Preference prefers constructions with a nominative relative pronoun over constructions with an accusative relative pronoun. Crucially, the preferences have different preference profiles. All three profiles cannot be satisfied simultaneously. So, it is obvious that there needs to be an interaction between the postulated preferences. This impression will be reinforced by the following tables.

Let us now consider free relative clause constructions with the nominative and dative cases. Crucially, this thesis uses an online method where language processing is measured incrementally. The Proto-Agent First Preference captures this as it prefers proto-agents in initial positions. Recall that this thesis only considers patient-like datives. However, before encountering the critical verb, the parser cannot know this and interprets dative relative pronouns as proto-agents in basic word order before encountering the critical, disambiguating verb in keeping with the Proto-Agent First Preference. Constructions with dative relative pronouns, therefore, are assumed to obey the Proto-Agent First Preference before the parser encounters the critical verb but they are apparent to not obey this preference after encountering the critical verb. Therefore, the preference profile before and after encountering the critical disambiguating verb need to be considered.

Let us first consider the profile before encountering the critical verb in (4.6):

(4.6) German free relative clause constructions with the nominative and dative cases before encountering the critical verb

Construction	**Subset Preference**	**Specificity Preference**	**Proto-Agent First Preference**
a. nominative match (mat-nomnom): *Keine Geduld besaß* ___, *wer* no patience had ___$_{nom}$ who$_{nom}$ *dem Sohn vertraut hatte.* the son trusted had 'No patience had who had trusted the son.'	√	√	√
b. dative match (mat-datdat): *Der Vater half* ___, *wem* the father helped ___$_{dat}$ whom$_{dat}$ *der Sohn vertraut hatte.* the son trusted had 'The father helped whom the son had trusted.'	√	√	√
c. hierarchy harmonic nominative-dative mismatch (har-nomdat): *Keine Geduld besaß* ___, *wem* no patience had ___$_{nom}$ whom$_{dat}$ *der Sohn vertraut hatte.* the son trusted had 'No patience had whom the son had trusted.'	√		√
d. hierarchy opposing dative-nominative mismatch (opp-datnom): *Der Vater half* ___, *wer* the father helped ___$_{dat}$ who$_{nom}$ *dem Sohn vertraut hatte.* the son trusted had 'The father helped whom had trusted the son.'			√

Turning to the Subset Preference in the second column, both match conditions (4.6a nominative match, mat-nomnom; and 4.6b dative match, mat-datdat) obey this preference as well as the hierarchy harmonic nominative-dative mismatch (4.6c har-nomdat) because in all constructions the set of features of case$_{matrix}$ is a proper or improper subset of the set of features of case$_{relative}$. Hence, according to the Subset Preference, these three constructions are equally preferred over the hierarchy opposing dative-nominative mismatch (4.6d opp-datnom) that violates this preference.

Let us now turn to the Specificity Preference in the third column. As explained before, only match conditions (4.6a nominative match, mat-nomnom; and 4.6b dative match, mat-datdat) obey this preference. According to the Specificity Preference, they are, therefore, equally preferred over both mismatch conditions (4.6c harmonic nominative-dative mismatch, har-nomdat; and 4.6d opposing dative-nominative mismatch, opp-datnom) violating this preference.

Turning to the Proto-Agent First Preference in the fourth column, all constructions obey this preference. Recall that nominative relative pronouns may unequivocally be interpreted as proto-agents and occur in an initial position in basic word order. Dative relative pronouns may also be interpreted as proto-agents and occur in an initial position in basic word order unless conflicting material is processed. The only possibly conflicting language material in the free relative clause is the critical verb which may not allow a proto-agent dative relative pronoun. However, the parser cannot know this before encountering the verb. Therefore, the proto-agent interpretation of the dative holds for the time being. Consequently, all four constructions obey this preference and no construction is preferred over another.

Again, the three different preference profiles cannot be satisfied simultaneously. This strengthens the assumption that they are, in fact, preferences in interaction with each other. Let us now turn to the same constructions, as in (4.6), after encountering the critical verb. As indicated above, after encountering the critical verb, when it becomes apparent that a proto-agent interpretation of the dative relative pronoun cannot be held, it solely affects the preference profile of the Proto-Agent First Preference. For illustration, see (4.7):

(4.7) German free relative clause constructions with the nominative and dative cases after encountering the critical verb

Construction	**Subset Preference**	**Specificity Preference**	**Proto-Agent First Preference**
a. nominative match (mat-nomnom): *Keine Geduld besaß* ___, *wer* no patience had $\_\_\__{nom}$ who_{nom} *dem Sohn vertraut hatte.* the son trusted had 'No patience had who had trusted the son.'	√	√	√

b. dative match (mat-datdat): *Der Vater half ___, wem* the father helped ___$_{dat}$ whom$_{dat}$ *der Sohn vertraut hatte.* the son trusted had 'The father helped whom the son had trusted.'	√	√	
c. hierarchy harmonic nominative-dative mismatch (har-nomdat): *Keine Geduld besaß ___, wem* no patience had ___$_{nom}$ whom$_{dat}$ *der Sohn vertraut hatte.* the son trusted had 'No patience had whom the son had trusted.'	√		
d. hierarchy opposing dative-nominative mismatch (opp-datnom): *Der Vater half ___, wer* the father helped ___$_{dat}$ who$_{nom}$ *dem Sohn vertraut hatte.* the son trusted had 'The father helped whom had trusted the son.'			√

Note that since the Proto-Agent First Preference is the only preference of the three postulated preferences concerned with incremental processing, the preference profiles for the Subset Preference and the Specificity Preference do not change. They are exactly how they were in (4.7) with the same explanation.

Only the Proto-Agent First Preference in the fourth column needs to be addressed at this point. Since this thesis is only concerned with patient-like dative relative pronouns, after encountering the verb, it becomes apparent that constructions with dative relative pronouns, in fact, do not obey this preference unlike previously assumed by the human parser. Rather, they violate it. Therefore, constructions with a nominative relative pronoun are preferred over those with a dative relative pronoun concerning the Proto-Agent First Preference. So, the nominative match (4.7a mat-nomnom) and the hierarchy opposing dative-nominative mismatch (4.7d opp-datnom) are equally preferred over the dative-match (4.7b mat-datdat) and the hierarchy harmonic nominative-dative mismatch (4.7c har-nomdat).

Let us now turn to the final constructions with the accusative and dative cases. Since the dative is involved and the thematic interpretation of dative relative pronouns is strongly

influenced by the critical verb whether being encountered or not, two different tables need to be introduced, as already seen above.

First, consider the preference profile before encountering the critical verb in (4.8):

(4.8) German free relative clause constructions with the accusative and dative cases before encountering the critical verb

Construction	**Subset Preference**	**Specificity Preference**	**Proto-Agent First Preference**
a. accusative match (mat-accacc): *Der Vater umarmte ___, wen* the father hugged ___$_{acc}$ whom$_{acc}$ *der Sohn korrigiert hatte.* the son corrected had 'The father hugged who the son had corrected.'	√	√	
b. dative match (mat-datdat): *Der Vater half ___, wem* the father helped ___$_{dat}$ whom$_{dat}$ *der Sohn vertraut hatte.* the son trusted had 'The father helped whom the son had trusted.'	√	√	√
c. hierarchy harmonic accusative-dative mismatch (har-accdat): *Der Vater umarmte ___, wem* the father hugged ___$_{acc}$ whom$_{dat}$ *der Sohn vertraut hatte.* the son trusted had 'The father hugged whom the son had trusted.'	√		√
d. hierarchy opposing dative-accusative mismatch (opp-datacc): *Der Vater half ___, wen* the father helped ___$_{dat}$ whom$_{acc}$ *der Sohn korrigiert hatte.* the son corrected had 'The father helped whom the son had corrected.'			

Let us first consider the Subset Preference in the second column. As indicated in previous tables, match conditions (4.8a accusative match, mat-accacc; and 4.8b dative match, mat-datdat) and the hierarchy harmonic accusative-dative mismatch (4.8c har-accdat) are equally

preferred over the hierarchy opposing dative-accusative mismatch (4.8d opp-datacc). This is because in the first three constructions the set of features of $case_{matrix}$ is a proper (for the harmonic mismatch) or improper (for the matches) subset of the set of features of $case_{relative,}$ while this is not true for the hierarchy opposing dative-accusative mismatch construction.

Turning to the Specificity Preference in the third column, yet again, match constructions are the only constructions obeying this preference (4.8a accusative match, mat-accacc; and 4.8b dative match, mat-datdat) and are, therefore, equally preferred over the mismatch conditions (4.8c harmonic accusative-dative mismatch, har-accdat; and 4.8d opposing dative-accusative mismatch, opp-datacc).

Let us now consider the Proto-Agent First Preference in the fourth column. Since the critical verb has not been encountered at this point, the dative relative pronoun is interpreted as a proto-agent and therefore can occur in an initial sentence position in basic word order. Accusative relative pronouns are proto-patients and therefore cannot occur in an initial sentence position in basic word order. Thus, constructions with dative relative pronouns (4.8b dative match, mat-datdat; and 4.8c harmonic accusative-dative mismatch, har-accdat) obey the Proto-Agent First Preference. They are, therefore, equally preferred over the accusative match (4.8a mat-accacc) and the hierarchy opposing dative-accusative mismatch (4.8d opp-datacc) which violate this preference. Once more, it is apparent that not all preference profiles can be satisfied simultaneously and an interaction must be at work.

To finalize the consideration of the preference profiles for the accusative and dative case combination, let us now look at the profile after encountering the verb in (4.9):

(4.9) German free relative clause constructions with the accusative and dative cases after encountering the critical verb

Construction	**Subset Preference**	**Specificity Preference**	**Proto-Agent First Preference**
a. accusative match (mat-accacc): *Der Vater umarmte ___, wen* the father hugged ___$_{acc}$ whom$_{acc}$ *der Sohn korrigiert hatte.* the son corrected had 'The father hugged who the son had corrected.'	√	√	

b. dative match (mat-datdat): *Der Vater half ___, wem* the father helped ___$_{dat}$ whom$_{dat}$ *der Sohn vertraut hatte.* the son trusted had 'The father helped whom the son had trusted.'	√	√	
c. hierarchy harmonic accusative-dative mismatch (har-accdat): *Der Vater umarmte ___, wem* the father hugged ___$_{acc}$ whom$_{dat}$ *der Sohn vertraut hatte.* the son trusted had 'The father hugged whom the son had trusted.'	√		
d. hierarchy opposing dative-accusative mismatch (opp-datacc): *Der Vater half ___, wen* the father helped ___$_{dat}$ whom$_{acc}$ *der Sohn korrigiert hatte.* the son corrected had 'The father helped whom the son had corrected.'			

Again, since only the Proto-Agent First Preference is concerned with incremental processing, this is the only preference with changes. The preference profiles for the Subset Preference and the Specificity Preference remain the same for the same reasons explained concerning (4.8).

Turning to the Proto-Agent First Preference, after encountering the critical verb it becomes apparent that the dative relative pronoun which was originally interpreted as a proto-agent is patient-like instead. Thus, constructions with dative relative pronouns (4.9b dative match, mat-datdat; and 4.9c harmonic accusative-dative mismatch, har-accdat) are patient-like instead of proto-agents. Consequently, all four constructions violate the Proto-Agent First Preference and none of them is preferred over another. As in all tables before, different preference profiles cannot be satisfied simultaneously.

However, all general, construction-independent preferences were shown to be operative in free relative clauses (Subset Preference and Specificity Preference) or must be assumed to be operative in free relative clauses (Proto-Agent First Preference). This provides strong evidence that the three postulated preferences interact with each other. In this respect, a powerful tool to capture and modulate the interaction between conflicting

preferences is Optimality Theory (OT, Prince & Smolensky 1993, 2004). The next chapter will provide an introduction to Optimality Theory and show how the three preferences can be adapted to fit with the framework of this model.

4.3. Introduction to Optimality Theory

Chapter (4.2. Conflicting preferences in free relative clauses) explained how the three postulated universal, and possibly violable, preferences operative in German free relative clauses conflict with each other. They prefer different constructions over others. Thus, there are conflicting preference profiles that cannot be satisfied simultaneously. It was consequently argued that these conflicting preferences interact with each other. For convenience, the preferences are once more provided again below in (4.10)–(4.12):

(4.10) Subset Preference:
A morphological exponent, M, is compatible with a syntactic context, S, if M realizes a (proper or improper) subset of the morphosyntactic feature set of S.

(4.11) Specificity Preference:
In a context with multiple compatible morphological exponents, the morphological exponent with the highest specificity is chosen.

(4.12) Proto-Agent First Preference:
Proto-agents precede proto-patient co-arguments in basic word order.

The fact that the preferences seem to interact with other (see Chapter 4.2. Conflicting preferences in free relative clauses), their universality, and their potential violability provides a persuasive reason to opt for Optimality Theory (OT; Prince & Smolensky 1993, 2004) as a suitable theoretical model. In the OT framework, constraint interaction is captured by ranking constraints and by evaluating whether grammatical structures comply to the highest constraint or not. The evaluation procedure is documented in a tableau which provides a good tool to test the relevance and ranking of specific constraints. Previous research (Vogel 2011) concerning German free relative clauses already opted for Optimality Theory (see Chapter 2.2.2. Feature decomposition of case). The approach of the current thesis also opts

for Optimality Theory bridging current with previous research. Importantly, previous research (Vogel 2011) showed in which contexts headed relative clauses are to be chosen over free relative clauses while the current approach is solely concerned with preferences within free relative clauses.

In order to understand more precisely how the three postulated preferences interact with each other within the OT framework, let us first consider the four basic assumptions OT, as given in (4.13, cf. Kager 1999: 11-13, see also Müller 2000):

(4.13) Basic assumptions of Optimality Theory:

a. Universality: Constraints are universal
b. Violability: Constraints are violable
c. Ranking: Constraints are ranked
d. Competition: The well-formedness of a linguistic expression cannot solely be determined on the basis of its internal properties. Rather, external factors (the competition between different linguistic expressions) determine whether a linguistic expression is grammatical or not. These linguistic expressions are called *candidates*.

The basic assumptions given in (4.13) state that there are ranked constraints. The constraints are universal, but their ranking is not. The ranking is language-dependent. All the constraints are violable. A violation of a constraint may cause a candidate to be sorted out.

While this is not what Optimality Theory originally intended illustrating processing costs within the OT framework has been successfully established (cf. Gibson & Broihier 1998, Hoeks & Hendriks 2005). Hoeks & Hendriks (2005: 1) argue:

> In its strongest form this approach considers all theoretical constraints to be processing restrictions and vice versa, and it is postulated that this model can be a model of competence (i.e., traditionally called 'grammar') and a model of performance (i.e., traditionally called 'parser') at the same time.

All of the basic assumptions of OT are applicable to the three construction-independent preferences, as given in (4.10)–(4.12). These preferences are assumed to reflect the processing costs for the self-paced reading study of the current thesis. Accordingly, they

need to be transferred to constraints addressing processing costs in German free relative clause constructions, as given in (4.14)–(4.16):

(4.14) Prediction by SUBSET

In conditions whose set of features of the case of the covert head ($case_{matrix}$) is a subset of the set of features of the case of the relative pronoun ($case_{relative}$) the relative pronoun is read faster than in conditions whose set of features of the case of the relative pronoun ($case_{relative}$) is a subset of the set of features of the cover head ($case_{matrix}$).

(4.15) Prediction by SPECIFICITY:

In conditions whose set of features of the case of the covert head ($case_{matrix}$) is identical to the set of features of the case of the relative pronoun ($case_{relative}$) the relative pronoun is read faster than in condition whose set of features of the case of the covert head ($case_{matrix}$) is not identical to the set of features of the case of the relative pronoun ($case_{relative}$).

(4.16) Prediction by No-PATIENT-RelPron:

In conditions with proto-agent relative pronouns in initial position the relative pronouns and the critical verb are read faster than in conditions with proto-patient relative pronouns in initial position.

The first basic assumption, universality (4.13a), is applicable to the constraints in (4.14)–(4.16). The constraint SUBSET and the constraint SPECIFICITY are based on a theoretical approach utilizing features (cf. Chapter 2.2. Morphosyntactic approach to case in free relative clauses). The preferences that the constraints are derived from have been shown to be operative in numerous linguistic areas (for German free clauses utilizing case features, see Mewe 2014; for a similar approach, see Himmelreich 2017; for other morphosyntactic research utilizing features, see Opitz et al. 2013, Opitz & Pechmann, Penke et al. 2014). The Proto-Agent First Preference (4.12) replaces the construction-dependent Subject Preference for relative pronouns and explains incremental processing effects. It is also shown to be applied universally (empirical evidence by Bornkessel et al. 2002 and Bornkessel et al. 2003).

The constraints (4.14)–(4.16) conflict with each other (basic assumption 4b. violability), as already discussed in the previous chapter (4.2. Conflicting preferences in free relative clauses). For example, an accusative match (mat-accacc) and a nominative match (mat-nomnom) are not predicted to differ from each other concerning the constraint SPECIFICITY (4.15). Both matches obey the constraint. Turning to No-PATIENT-RelPron, a nominative match (mat-nomnom) is preferred over an accusative match (mat-accacc) because the latter violates the constraint. Thus, it is inevitable that the constraints are violable and in competition with each other.

Turning to the ranking of the identified constraints, empirical data of previous research (Mewe 2014 and Vogel 2011, see also Pittner 2003) established a first ranking of constraints for German free relative clauses. The approach pursued in the current thesis corroborated this preliminary ranking theoretically. Specifically, the constraint SUBSET (4.14), which is based on the Subset Preference (4.10), must logically be ranked below the constraint SPECIFICITY (4.15), which is based on the Specificity Preference. The Subset Preference only requires the set of case features of the covert head to be a (proper or improper) subset of the set of case features of the relative pronoun. In contrast, the Specificity Preference requires the set case features of the covert head to be the most specific of the compatible sets for the current context (i.e. the cases of the covert head and the relative pronouns are identical as in the match conditions). Consequently, SPECIFICITY must be ranked higher than SUBSET. This is much in line with the Paninian Principle (Noyer: 1992: 104): “If one rule’s structural description is contained in the other’s, the rule with the more specific structural description applies first.”

The constraint No-PATIENT-RelPron (4.16) has hitherto not been considered in research on free relative clauses because it is only applicable for online methods for its dealing with incremental processing. In order to integrate this constraint, assumptions about cues need to be considered (cf. the Competition Model of Bates & MacWhinney 1989). Regarding the relative pronoun, the parser can immediately examine whether a free relative clause construction obeys or violates No-PATIENT-RelPron when encountering the relative pronoun. No other information or comparisons with other entities of the sentence are required. Thus, the case of the relative pronoun is a local cue. Iff the relative pronoun is an accusative, it unequivocally violates No-PATIENT-RelPron. Since at the point of the relative pronoun only this entity has to be evaluated, the constraint No-PATIENT-RelPron can be

assumed to operate fast. In contrast, the other two postulated constraints, SPECIFICITY and SUBSET, rely on a comparison between the case of the covert head in the matrix clause (henceforth: $case_{matrix}$) and the case of the relative pronoun (henceforth: $case_{relative}$). Thus, they use global cues. The comparison between $case_{matrix}$ and $case_{relative}$ and storing the $case_{matrix}$ in working-memory is computationally demanding. It is, therefore, potentially slower than examining solely the relative pronoun as the constraint No-PATIENT-RelPron does.

However, there is an alternative approach to integrate No-PATIENT-RelPron. The covert head and the relative pronoun occur linearly adjacent. Therefore, the covert head may still be strongly activated in working memory (with little or no decay) when encountering the relative pronoun. This may prevent the relative pronoun to be processed slowly due to computational demand between $case_{matrix}$ and $case_{relative}$ (cf. McElree et al. 2003). Thus, according to this approach, No-PATIENT-RelPron may not be ranked higher than SUBSET or SPECIFICITY. Note that both approaches can only be speculated on as No-PATIENT-RelPron is not corroborated by research on German free relative clauses as previous research exclusively used offline methods. Even though the ranking of No-PATIENT-RelPron may only be assumed for the time being, a logical and empirically corroborated ranking between SPECIFICITY and SUBSET (SPECIFICITY >> SUBSET) is strongly suggested. Thus, the basic assumption of constraint ranking (4.13c) is applicable.

The basic assumption of competition (4.13d) is also applicable because in each of the three experiments four free relative clause constructions with different case combinations (= *candidates*) are evaluated. As stated before, it is inevitable that the constraints are violable and in competition with each other. Well-formedness is not an inherent characteristic of the candidates. Rather, their well-formedness is determined by the candidates' constraint violation. This, in turn, should be reflected in reading time differences between the candidates in the experiments carried out in this thesis.

Within the OT framework, the candidates, constraints, violation of constraints, and the winner of an evaluation are illustrated with a tableau. In a tableau, violations of constraints are indicated by an asterisk (*). A violation is fatal for a candidate (indicated by an exclamation mark after the asterisk: *!) when there is at least one other candidate left in the evaluation who does not violate this constraint. As a result, the winner of an evaluation (indicated by a pointing hand ☞) is the optimal output.

Let us now turn to the interaction between constraints[56] postulated in the current thesis. Ranking is anchored in the OT's basic assumptions (4.12c). However, there are different kinds of rankings within the OT framework. This section will show three different kinds or rankings (strict ranking, irrelevant ranking, tied constraints) on the case combination accusative and dative in German free relative clauses as an example. Let us first consider strict ranking, as given in Tableau 4.1[57]:

Tableau 4.1: tableau with strict ranking between constraints before encountering the disambiguating critical verb

Input[58]: $case_{matrix}$, $case_{relative}$	No-PATIENT-RelPron	SPECIFICITY	SUBSET
mat-accacc[59]: *The father hugged* ___$_{acc}$ *whom*$_{acc}$...	*!		
☞ mat-datdat: *The father helped* ___$_{dat}$ *whom*$_{dat}$...			
har-accdat: The father hugged___$_{acc}$ *whom*$_{dat}$...		*	
opp-datacc: *The father helped* ___$_{dat}$ *whom*$_{acc}$...	*!	*	*

In a strict ranking, the constraints are ranked linearly as indicated by the vertical lines between the constraints. This means that the first constraint is ranked higher than the second which is ranked higher than the third etc. In the example above (Tableau 4.1), No-

[56] Note that a faithfulness constraint (a constraint aiming toward maximal congruency between input and output) is not explicitly presented in this thesis but must always be assumed to be ranked higher than the three constraints this thesis focusses on. Such a faithfulness constraint is obeyed only by candidates with the cases of set of case features assigned by the matrix verb (for the covert head) or the verb of the free relative clause (for the relative pronoun), respectively. All other candidates, including silence, are immediately excluded. Since this faithfulness constraint must always be assumed, it is always ranked higher than the constraints focussed in this thesis and it does not alter the OT profiles of the candidates this thesis is concerned with. It is not explicitly presented in the thesis and the tableaux.
The constraints being dealt with in this thesis are all markedness constraints. For more information on faithfulness constraints and markedness constraints, see Kager 1999, Müller 2000, Businger 2007.

[57] Note that all of the tableaux provided as examples refer to processing before the critical disambiguating verb is encountered. This is crucial for candidates with dative relative pronouns. No proto-agent dative relative pronouns were used in the test material of this thesis. However, since datives may occur in initial positions as a basic word order when they are proto- agents (see Chapter 3.3. Deconstructing the subject notion), the parser assumes dative relative pronouns to be proto-agents and not to violate NO-PATIENT-RelPron unless proven otherwise. This proof occurs only when the critical disambiguating verb is encountered.

[58] In the input, there are the cases of the covert head and the relative pronoun. These cases are assigned by the matrix verb ($case_{matrix}$) and the verb of the relative clause ($case_{relative}$), respectively. In the example given in Tableau 4.1 and the following tableaux in this chapter, $case_{matrix}$ is accusative (mat-accacc; har-accdat) or dative (mat-datdat; opp-datacc) and $case_{relative}$ is accusative (mat-accacc; opp-datacc) or dative (mat-datdat; har-accdat). For the OT approach to case assignment, see, for example, Woolford 2001.

[59] For convenience, the example sentences for the candidates in Tableau 4.1 are provided in English. The test sentences in the experiments were exclusively German.

PATIENT-RelPron is ranked higher than SPECIFICITY which is ranked higher than SUBSET. The candidates with a dative relative pronoun do not violate No-PATIENT-RelPron while the candidates with an accusative relative pronoun violate this constraint (indicated by an asterisk: *). Since there are candidates that do not violate this constraint, all the candidates with accusative relative pronouns are excluded from further evaluation. This is called a fatal violation and indicated by an exclamation mark after the asterisk (*!). Thus, only the dative match (mat-datdat) and the hierarchy harmonic accusative-dative mismatch remain in the evaluation. SPECIFICITY is the constraint ranked lower than No-PATIENT-RelPron in Tableau 4.1 above. This constraint is violated by only one of the remaining candidates (har-accdat). Thus, the optimal candidate is the dative match (mat-datdat). This candidate does not violate any constraints. It is the intrinsic winner of the evaluation. So, ranking becomes irrelevant, as illustrated in Tableau 4.2:

Tableau 4.2: tableau without ranking between constraints before encountering the disambiguating critical verb

Input: $case_{matrix}$, $case_{relative}$	No-PATIENT-RelPron	SPECIFICITY	SUBSET
mat-accacc: *The father hugged* $\_\_\__{acc}$ $whom_{acc}$...	*		
☞ mat-datdat: *The father helped* $\_\_\__{dat}$ $whom_{dat}$...			
har-accdat: The father hugged$____{acc}$ $whom_{dat}$...		*	
opp-datacc: *The father helped* $\_\_\__{dat}$ $whom_{acc}$...	*	*	*

In Tableau 4.2, ranking is irrelevant which is indicated by the missing lines between the constraints. As mentioned above, the dative match is the intrinsic winner of the evaluation because it does not violate any constraints. The other candidates violate at least one constraint. The accusative match violates No-PATIENT-RelPron. The hierarchy harmonic accusative-dative mismatch violates SPECIFICITY. The hierarchy opposing mismatch violates all constraints. Thus, any ranking of the constraints would lead to the dative match being the winner, thereby rendering the ranking irrelevant. This is symbolized in Tableau 4.2 by missing vertical lines.

Another option for constraint ranking are tied constraints. Pesetsky (1998: 13) formulates the Constraint Tie and its outcome as follows (4.17):

(4.17) Constraint Tie:
The output of a set of *tied* constraints is the union of the outputs of every possible ranking of those constraints.

A consequence of tied constraints are multiple evaluations with every possible ranking between the tied constraints. Importantly, as stated in (4.17) above, the output of the tied constraints are the outputs of all possible rankings of the tied constraints. An example of tied constraints is shown in Tableau 4.3:

Tableau 4.3: tableau with locally tied constraints (No-PATIENT-RelPron and SPECIFICITY) before encountering the disambiguating critical verb

Input: $case_{matrix}$, $case_{relative}$	No-PATIENT-RelPron	SPECIFICITY	SUBSET
☞mat-accacc: *The father hugged* ___$_{acc}$ *whom*$_{acc}$...	*		
☞ mat-datdat: *The father helped* ___$_{dat}$ *whom*$_{dat}$...			
☞ har-accdat: The father hugged___$_{acc}$ *whom*$_{dat}$...		*	
opp-datacc: *The father helped* ___$_{dat}$ *whom*$_{acc}$...	*	*	*

In Tableau 4.3 the constraints No-PATIENT-RelPron and SPECIFICITY are locally tied which is indicated by the dotted line between them. Both constraints are ranked higher than SUBSET, which is indicated by the line between SUBSET and SPECIFICITY. By tying No-PATIENT-RelPron and SPECIFICITY the dative match is no longer the intrinsic winner of the evaluation. As mentioned above, tied constraints lead to multiple evaluations with every possible ranking between the tied constraints. In this case, the constraint tie of No-PATIENT-RelPron and SPECIFICITY leads to two evaluations. In the first evaluation—i.e. No-PATIENT-RelPron >> SPECIFICITY—the dative match (mat-datdat) and the hierarchy harmonic mismatch (har-accdat) are the winners. In the second evaluation—i.e. SPECIFICITY >> No-PATIENT-RelPron— the match conditions (mat-accacc and mat-datdat) are the winners. Following Pesetsky's approach concerning tied constraints where the output (winner) is the combination of the outputs (winners) of all possible rankings between No-PATIENT-RelPron and SPECIFICITY the tie results in three winners of the evaluation: accusative match (mat-accacc), dative match (mat-datdat), and harmonic mismatch (har-accdat). The intrinsic loser is the hierarchy opposing dative-accusative mismatch (opp-datacc).

To summarize, three construction-independent, possibly universal, violable preferences were postulated in Chapter 2.2. (Morphosyntactic approach to case in free relative clauses) and Chapter 3.3. (Deconstructing the subject notion). Their preference profiles are in conflict and cannot be satisfied simultaneously. Further, none of them can account for previous data alone nor, as will be shown in Chapter 5 (Empirical evidence), the data of the current thesis. An interaction must be assumed. The fact that the preferences seem to interact with other, their universality, and their potential violability provided a persuasive reason to opt for Optimality Theory. The three preferences were transformed into constraints in order to fit the OT framework. They are concerned with processing costs as the study of the current thesis uses an online method. It was shown that all the basic assumptions of OT are applicable. Further, three different ranking were introduced and discussed. The interim discussions of the experiments of the current thesis will show how they apply to the results (see Chapter 5 Empirical evidence).

4.4. Summary

This chapter serves three different purposes to summarize all the information necessary for the experimental studies provided in the next chapter. First, a comparison of preferences in free and headed relative clauses was provided (Chapter 4.1. Recapitulation of preferences for free and headed relative clauses). The commonalities between those two types of constructions were highlighted throughout this thesis, especially in Chapter 2. Previous research often neglected to refer to the preferences identified in headed relative clauses when discussing the preferences identified in free relative clauses. This chapter compared the universal, constructions-independent preferences operative in free relative clauses and the preferences in headed relative clauses. Their similarity supports the approach that the previously assumed construction-dependent preferences (or rules) for free relative clauses need to be replaced with universal preferences.

Second, the violability of all the three postulated preferences operative in free relative clauses was addressed (Chapter 4.2. Conflicting preferences in free relative clauses) using tables. Constructions similar to the test material of the study of this thesis were provided. It was then shown which preferences prefer which constructions over others. This

clearly illustrated that not all preferences can be satisfied simultaneously. Instead, the violable preferences are in conflict and interact with each other.

Third, a powerful tool to model these conflicting, interacting, violable preferences was introduced: Optimality Theory (OT, Chapter 4.3. Introduction to Optimality Theory). This introduction explained the general mechanism of OT and how the topic of this thesis fits this framework. The preferences formulated in this thesis were shown to fit all the basic assumption of the OT framework and therefore were transferred to constraints. These constraints function as predictions for processing costs of the constructions of German free relative clauses in the study of this thesis. Further, as a crucial aspect of OT, the mechanisms of tableaux were explained. In the course of this, different options of ranking, which will be relevant for the analysis of the experimental findings in Chapter 5, were highlighted.

5 Empirical evidence

Previous studies concerning case in German free relative clauses provided offline data of acceptability studies (cf. Bausewein 1991, Mewe 2014, Vogel, Frisch & Zugck 2006, Vogel 2011) and corpus studies (cf. Pittner 2003, Vogel & Zugck 2003) and mostly relied on construction-specific approaches to describe the data.

The approach of the current thesis utilizes construction-independent preferences that were discussed in detail in Chapter (2.2.4. Implementing the principles to free relative clauses) and Chapter 3.3. (Deconstructing the subject notion). It is assumed that the three identified preferences—the Subset Preference, the Specificity Preference, and the Proto-Agent First Preference—can account for and explain case match and case mismatch phenomena in German free relative clauses. For convenience, the three preferences are provided again below in (5.1)–(5.3):

(5.1) Subset Preference:
A morphological exponent, M, is compatible with a syntactic context, S, if M realizes a (proper or improper) subset of the morphosyntactic feature set of S.

(5.2) Specificity Preference:
In a context with multiple compatible morphological exponents, the morphological exponent with the highest specificity is chosen.

(5.3) Proto-Agent First Preference:
Proto-agents precede proto-patient co-arguments in basic word order.

Chapter 4.2. (Conflicting preferences in free relative clauses) explained that the three preferences conflict with each other. Thus, preference profiles cannot be satisfied simultaneously. An interaction between these preferences, therefore, needs to be assumed.

As the preferences seem to interact with each other, their universality and potential violability provide a persuasive reason to opt for Optimality Theory (OT; Prince & Smolensky 1993, 2004) as a suitable theoretical model, which was addressed in the previous chapter (Chapter 4.3. Introduction to Optimality Theory). In order to fit the OT framework, the three postulated preferences in (5.1)–(5.3) above were transferred to constraints on which the hypotheses concerning the experiments of this theses will be based.

The current thesis has proposed that the Proto-Agent First Preference may, inter alia, account for empirical patterns in processing free relative clauses. The preference also bears important implications in terms of incremental processing within sentences, i.e. the fact that sentence interpretation is updated with every new incoming piece of information. Given that incremental processing holds for language comprehension in general (see Chapter 3.3 and the Principle of Incremental Comprehension cited in 3.13), the order of case-marked arguments within the free relative clause determines processing difficulty. In contrast to previous research, the approach put forward in the present thesis cannot use an offline method to investigate the applicability of the Proto-Agent First Preference in incremental processing, but needs to include an experimental method with sufficient temporal and spatial resolution. The self-paced reading paradigm provides the possibility of locating processing difficulties within German free relative clauses, as it can reveal a detailed image of when (temporal resolution) and where (spatial resolution) processing difficulties occur during sentence reading. Thus, the self-paced reading paradigm provides a more fine-grained analysis, time-locked to individual words of the given construction, than offline measures such as acceptability judgements, and is therefore more suitable to test if the formulated preferences, and especially the Proto-Agent First Preference, are congenial. A detailed description of this paradigm is provided in Chapter 5.1. (The self-paced reading paradigm) below. In order to keep the experimental design and statistical analysis feasible, the different case combinations were distributed across three experiments, each combining two of the cases nominative, accusative and dative.

In Chapter 2.2. (Morphosyntactic approach to case in free relative clauses) and Chapter 3.3. (Deconstructing the subject notion), three construction-independent, possibly violable, preferences were postulated. The Subset Preference (based on the subset principle) was introduced to replace the construction-dependent Case Hierarchy Preference (see Chapter 2.1.2. Case Hierarchy Rule in free relative clauses). The Specificity Preference (based

on the specificity principle) can explain why case match is favored over case mismatch, including an advantage over mismatches obeying the Case Hierarchy Preference (harmonic mismatches). The Proto-Agent First Preference is meant to replace the construction-dependent Subject Preference for relative pronouns and to explain the incremental processing effects, as discussed in this section. As explained in Chapter 4.2. (Conflicting preferences in free relative clauses), these postulated construction-independent, universal, violable preferences make contradictory predictions (see also Chapter 2.2. Morphosyntactic approach to case in free relative clauses and Chapter 3.3. Deconstructing the subject notion), and therefore an interaction, modeled within the OT framework, was introduced. Constraints formulated based on the preferences in (5.1)–(5.3) provide predictions for online processing. It is assumed that any processing cost would occur first at the relative pronoun itself and possibly on the verb in the free relative clause. The relative pronoun is a critical region because when encountering it, it becomes apparent whether a sentence obeys SUBSET and SPECIFICITY, respectively. Further, the case of the relative pronoun provides a crucial cue for No-PATIENT-RelPron concerning its (assumed) thematic role. The critical verb in the free relative clause confirms or contradicts to this interpretation. Therefore, this is the other region of interest. Note that effects may also occur in spill-over regions. For convenience, the predictions of the constraints are provided in (5.4)–(5.6):

(5.4) Prediction by SUBSET

In conditions whose set of features of the case of the covert head ($case_{matrix}$) is a subset of the set of features of the case of the relative pronoun ($case_{relative}$) the relative pronoun is read faster than in conditions whose set of features of the case of the relative pronoun ($case_{relative}$) is a subset of the set of features of the cover head ($case_{matrix}$).

(5.5) Prediction by SPECIFICITY:

In conditions whose set of features of the case of the covert head ($case_{matrix}$) is identical to the set of features of the case of the relative pronoun ($case_{relative}$) the relative pronoun is read faster than in condition whose set of features of the case of the covert head ($case_{matrix}$) is not identical to the set of features of the case of the relative pronoun ($case_{relative}$).

(5.6) Prediction by No-PATIENT-RelPron:

In conditions with proto-agent relative pronouns in initial position the relative pronouns and the critical verb are read faster than in conditions with proto-patient relative pronouns in initial position.

The predictions deduced from the constraints conflict with each other, much like the preferences they are based on (see Chapter 4.2. Conflicting preferences in free relative clauses). They make different predictions for conditions (= candidates). For example, an accusative match (mat-accacc) and a nominative match (mat-nomnom) are not predicted to differ from each other concerning the constraint SPECIFICITY (5.5). Both matches obey the constraint. Turning to No-PATIENT-RelPron, a nominative match (mat-nomnom) is preferred over an accusative match (mat-accacc) because the latter violates the constraint. Note that the predictions of the constraints will be adjusted to the specific case combination for each experiment for maximal transparency and clarity.

5.1. The self-paced reading paradigm

Data collected in the self-paced reading paradigm provides more detailed and complex information than data collected in so-called offline methods like acceptability judgement studies. This is due to the fact that self-paced reading is an online method. *Online* means that language processing can be measured as it happens – hence, incremental processing can be illustrated as well. In self-paced reading, incremental processing of words (or larger regions of text) is illustrated by providing reaction time measurements mapped to the words or regions read by the participant. Time measurements are collected by the participants pressing a button to continue reading a sentence. In contrast to fixed-paced methods where reading times are determined by the researcher (like rapid serial visual presentation, RSVP) participants can decide when they want to go on reading on their own. They can read at their own pace. Therefore, this method is called *self-paced reading*. While for all self-paced reading experiments participants control their reading pace there are different methods of sentence presentation. The current thesis uses the word-by-word, non-cumulative linear method to present the sentences (consisting of test material and fillers). In a word-by-word

presentation every single word is presented in isolation. There are no larger segments or word groups presented when pressing the button to continue. While this does not reflect natural reading it provides most precise collection of measurements in terms of spatial resolution (i.e., when processing difficulty emerge). This is crucial for the purpose of this thesis for the following reasons. As both the relative pronoun and the verb of the free relative clause are critical regions a word-by-word presentation is preferred over presenting the entire free relative clause at once. Additionally, relative pronouns are very short and might not be properly read when occurring in a larger segment. This, again, favors a word-by-word presentation. Besides that, a problem for the researcher arises when deciding on which words to group together. The decision of segment formation might influence the reading behaviors of participants even if it was not intended by the researcher (cf. Gilboy & Sopena 1996). Further, a word-by-word presentation allows for a later collapse of words into larger segments but not vice versa.

A non-cumulative presentation refers to how many words are presented on the screen at any given time. As indicated by the name, in a non-cumulative presentation pressing a button does not only reveal the next word but makes the previous word disappear. This makes regression to previous segments impossible. While this way of presenting test material is not natural it is often preferred to the cumulative method (cf. Jegerski 2014: 22). In the cumulative method, a word is also revealed by pressing a button. In contrast to the non-cumulative method none of the previously presented words disappears. This has been shown to influence participants' reading in that the participants may tend to reveal several segments at once and read them afterward (cf. Ferreira & Henderson 1990, Just et al. 1982). This distorts the idea of mapping reading time and specific segments with each other. Consequently, for the studies of the current thesis, the non-cumulative method was chosen.

A linear presentation refers to where on the screen the individual segments are presented. In a linear presentation the segments are presented in linear succession from left to right oriented on regular reading. Underlines indicate the length of words and sentences. Each underline represents one letter and a group of underlines represents words. For the self-paced reading study of this thesis a non-cumulative linear presentation was used where participants see a screen with grouped underlines. By pressing a button the first group of underlines gets transformed into a word. By another button press the first word transforms

back into a group of underlines and the second group of underlines transforms into a word (also known as *moving windows technique*, Jegerski 2014: 22). The participants repeat this until the end of the sentence. To get an idea how the screen looked like for participants, an approximation of the presentation of the sentences is provided below in (5.7):

(5.7) Approximation of the presentation of the sentences participants read[60] ('*Der Vater umarmte, ...*' The father hugged, ...)

a. ___ _____ _______, ___ ___ ____ __________ _____.

b. Der _____ _______, ___ ___ ____ __________ _____.

c. ___ Vater _______, ___ ___ ____ __________ _____.

d. ___ _____ umarmte, ___ ___ ____ __________ _____.

Example (5.7a) shows the screen participants see before pressing the button for the first time. In (5.7b) participants pressed the button once to reveal the first word (*Der*). Another button press (see 5.7c) reveals the next word (*Vater*) and makes the previous word return to underlines (*Der*). Another button press (see 5.7d) reveals the third word (*umarmte*) and makes the previous word return to underlines (*Vater*). Participants keep on reading through the entire sentence by button press. Note that the illustration in (5.7) is not complete but cut off after revealing the third word as this seems to be sufficient to explain the presentation of the sentences in the self-paced reading paradigm.

The time between button presses is measured. The idea of measuring the duration between button presses is that it indicates processing difficulty. The amount of time it takes for participants to read a word is assumed to reflect the time they need to process the word (cf. Just & Carpenter 1980). This direct mapping is, in fact, more complicated than originally assumed. However, the basic principle still holds. Increased reading times are expected, for example, for anomalies concerning non-canonical permutations of word order or syntactic long-distance dependency (Jegerski 2014: 23–4). Importantly, increased reading times

[60] Note that there were no line breaks in any of the test sentences on the computer screen. The break that can be seen in the examples is only due to lack of width of the page.

reflecting processing difficulties may not appear directly in the critical region. It is well-known that the effects of self-paced reading often occur in spill-over regions (Bornkessel-Schlesewsky & Schlesewsky 2009: 34). Spill-over regions are regions following the critical region. The nature of the method (i.e., pressing buttons to continue reading) causes participants to develop a pressing rhythm. Interrupting it to process a critical region may not be possible immediately. Rather, effects are skewed to later post-critical regions (i.e., spill-over regions). Alternatively, participants may not have finished processing the critical region and only do so while reading the spill-over region. This may also cause spill-over effects.

To ensure that the participants do not simply press through the stimuli but read them carefully a task is introduced. A suitable task for self-paced reading is answering comprehension questions after completing reading a sentence. This task was chosen for the experiments of this thesis. A third of the sentences (including test material and fillers) had comprehension questions which the participants were asked to answer by button press with *yes* or *no* (e.g., '*Did the father hug the son?*'). For the rest of the sentences the participants simply had to press *yes* to continue. There was no possibility for the participants to anticipate whether a comprehension question would occur or not while reading the sentence. The information that the comprehension question probed differed systematically across sentences to make participants read the entire sentence with all its information.

5.2. Experiment 1 (EXP1; acc, dat)

5.2.1. Material and design

The first experiment is concerned with the accusative and dative cases.
In order to i) keep the experiments comparable and ii) to be able to ascribe the effects to the manipulated aspect (case combination) a rather rigid guideline for generating the test items[61] was used, as given in (5.8)[62].

[61] The test items and fillers for all three experiments is provided in the Appendix.
[62] For examples for the test material, see (5.10).

(5.8) Guideline for the test material

a. only masculine singular NPs
b. only animate noun phrases
c. only verbs that are compatible with animate referents for relative pronoun and NP of the free relative clause
d. no co-references
e. similar spill-over regions and modifiers
f. identical material for the matrix clauses and for the free relative clauses
g. no particle verbs
h. no verbs assigning proto-agent datives
i. only transitive verbs in Experiment 1 (acc, dat)
j. only verbs that select *have* as an auxiliary
k. exclusion of matrix verbs that license indirect questions

To examine German free relative clauses empirically it is crucial to exclude influences or confounds not associated with the examined phenomenon or to keep them as minimal as possible. For a more detailed understanding of the rigid guidelines for the material, see (5.8a–k) below.

a. only masculine singular Noun phrases

All instances of cases need to be unambiguous to recognize cases unequivocally as the current thesis is not concerned with case ambiguities or syncretisms. To meet this requirement all NPs in the experimental material must be masculine singular NPs. In German only for them cases are unambiguous without any ambiguities or syncretisms.

b. only animate noun phrases

Animacy of noun phrases in headed relative clauses was proven to have crucial effects on the processing of free relative clauses with patient-first word order (cf. Traxler et al. 2002, Mak et al. 2002, 2006). It is an additional factor that this thesis is not concerned with. Therefore, any effects possibly caused by animacy of the noun phrases, including relative pronouns, need to be excluded. Thus, all noun phrases in the test material are animate. Further, this criterion guarantees for no case syncretisms on the relative pronoun. The present paper is concerned with the phenomenon of case (mis)matching in

German free relative clauses but only focuses on morphologically distinct instances. The relative pronoun *was*, which refers to inanimate referents, is ambiguous concerning case. It might code a nominative or an accusative case (for further research on this, see Vogel 2001). The morphologically distinct and unambiguous forms of German relative pronouns in are i) *wer* (nominative), ii) *wen* (accusative), and iii) *wem* (dative)[63]. All those relative pronouns refer to animate referents. Another possible confound can be ruled out by introducing only animate relatives: Animate referents tend to precede inanimate referents (cf. Branigan et al. 2008). Since word order has already been identified as a crucial aspect concerning thematic roles the mentioned confound needed to be excluded by neglecting inanimate referents.

c. only verbs that are compatible with animate referents for relative pronoun and NP of the free relative clause

Owing to the issues raised in (5.8b animate relative pronouns are used to avoid case syncretisms and a confound in word order), the chosen verbs must be at least compatible with animate referents; ideally prefer them. To keep the test items as parallel as possible not only the covert heads and the relative pronouns refer to animate referents but also the NPs besides the relative pronouns of the free relative clauses as well. This provides maximal clarity and transparency.

d. no co-references

To bypass the possible interferences by introducing a co-reference relation between NPs in the matrix clause and free relative clause no co-referential expressions are used. The relation between covert head and relative pronoun is one of the main interests in the experiments as two of the postulated preferences are concerned with this relation (Subset Preference and Specificity Preference). Co-referential expressions might establish yet another relation between the two entities. Therefore, only non-co-referential NPs were used in the free relative clause in this series of experiments.

[63] As stated before, the genitive is not focussed in this thesis.

e. similar spill-over region and modifiers

Modifiers had to be used to provide enough room for possible spill-over effects that are often found in self-paced reading, especially with short function words like relative pronouns (as discussed in Chapter 5.1. The self-paced reading paradigm). In self-paced reading, the participants tend to get into a rhythm to the button to continue. When participants are faced with an unexpected construction it often takes one to two words for them to react to it and slow down their rhythm. Thus, longer reaction times often do not occur directly in the critical region where processing difficulties occur but they are slightly shifted onward. Therefore, modifiers highly controlled for their lexical properties function as a spill-over region.

i) spill-over region after the relative pronoun

The first critical region is the relative pronoun (Position 1, see test material of Experiments 1, 2, and 3 and Example 5.10 below). At this point, it becomes apparent if there is a case match or a case mismatch and the kind of the case mismatch. It also becomes apparent whether the case of the relative pronoun (henceforth: $case_{relative}$) potentially codes a proto-agent or proto-patient. A full NP with a definite article following the relative pronoun functions as the spill-over region of the relative pronoun. For each item set the same NP was used in all conditions. Again, the NP is masculine in all instances for maximal clarity.

ii) auxiliary

Another critical region is the critical verb (position 5). It is especially crucial for No-PATIENT-RelPron (based on the Proto-Agent First Preference). Only when encountering the verb the human processor realizes that the initially assumed proto-agent dative (i.e. DatExp) is, in fact, a patient-like dative (DatPat). Therefore, it is necessary to investigate the reading times of the critical verb as well. Since the critical verb in German subordinate clauses is at the very end of a clause an auxiliary had to be used to provide a (albeit small) spill-over region. Hence, perfect tense was used in free relative clauses.

f. identical material for the matrix clauses and for free relative clauses

The matrix clauses and free relative clauses contained the same material to provide comparability. The possible effects of frequency or word length are thereby extinguished because those effects would affect all conditions equally. However, since the dative verbs fulfilling the requirements (see especially 5.8b, c, g, h, and i) are scarce special emphasis was put on use of fitting verbs for all necessary sentence pairings. Accusative and dative matrix clauses should fit both accusative and dative matrix clauses concerning plausibility.

g. no particle verbs

It was necessary to exclude particle verbs. Note, particle verbs might be separated into two parts in the matrix sentence and interrupted by the morphological markers of the past participle. It is unclear if and what kind of influence particle verbs might have on the processing of free relative clauses. Therefore, all particle verbs were excluded to keep the test items clear of any possible influence of other factors besides the phenomenon of interest.

h. no verbs assigning proto-agent datives

Proto-agents may occur sentence initially in basic word order (Proto-Agent First Preference). In incremental processing initial datives may be analyzed as proto-agents before encountering the critical verb. To be able to test if the Proto-Agent First Preference applies it is necessary to use verbs that license only patient-like datives. Only when the critical verb is encountered the parser realizes the incorrect initial proto-agent interpretation of the dative relative pronoun and needs to reanalyze. Such effects can most clearly be revealed by verbs assigning patient-like dative (cf. Bornkessel-Schlesewsky et al. 2004, Kretzschmar et al. 2012).

i. only transitive verbs for Experiment 1

In Experiment 1, the matrix verbs and the verbs of free relative clauses were only transitive verbs. Verbs licensing accusatives are usually transitive. However, verbs licensing datives are often ditransitive. To keep the test items as parallel as possible only transitive verbs were chosen. A pretest for Experiments 2 (nom, acc) and 3 (nom,

dat) revealed a neglectable influence of the use of intransitive verbs for matrix clauses with nominatives vis-a-vis transitive verbs.[64] Therefore, Experiment 2 and 3 have transitive and intransitive verbs in such conditions.

j. only verbs that select *have* as auxiliary

An auxiliary needed to be included in the test sentences to provide a spill-over region for the free relative clause's critical verb (see 5.8e). To keep the experiment design consistent only verbs that select *have* as an auxiliary were used. Alternating auxiliaries might have some effect on the data that is impossible to correct in statistical analysis. This potential influence was omitted by using only verbs that select *have* as an auxiliary.

k. exclusion of matrix verbs that license indirect questions

One crucial aspect in free relative clauses is the relation between the covert head of the matrix clause and relative pronoun. A free relative clause, by definition, is an attribute to an argument—in this case, to the covert head of the matrix verb. In contrast, indirect questions do not have a head in their matrix clause (see Chapter 1.2. What are free relative clauses). On a surface level, it is often impossible to distinguish between indirect questions and free relative clauses when the matrix verb allows both types. These types of verbs were excluded from the experimental test material.

The test material was generated with the matrix clause preceding the free relative clause. Previous research (cf. Bausewein 1991, Mewe 2014, Pittner 2003, Vogel 2011) found that this order provides more conclusive results than the matrix clause following the free relative clause.

Besides test conditions, four filler conditions were used to distract from the experimental question and to prevent floor and ceiling effects (Cowart: 1997: 51). The filler conditions consisted of headed relative clauses, indirect questions, distractors with homonyms, and other sentences with subordinate clauses (see Appendix). The filler conditions contained grammatical and ungrammatical constructions (cf. Cowart 1994). No

[64] mean rating for intransitive verbs (scale 1-4; higher number = higher acceptability): 3,36
mean rating for transitive verbs (scale 1-4; higher number = higher acceptability): 3,53

context was given for the test items or fillers. There were 160 test items (40 for each condition) distributed over eight lists (following a Latin Square design) and 58 filler sentences used in each list. Sentences were constructed following a 2 (case match vs. case mismatch) x2 (accusative covert head vs. dative covert head) design in order to compare all case combinations with each other, see (5.9).

Note that these factors are not fully orthogonal in that the case combination in each cell only occur in one of the two levels (eg. har-accdat and opp-datacc are always mismach while mat-accacc and mat-datdat are always a case match). Therefore the statistical model will use a single factor design as will be explained below in the respective section.

(5.9) Experimental design

	Case Mismatch	**Case Match**
Accusative covert head	har-accdat = hierarchy harmonic accusative-dative mismatch	mat-accacc = accusative match
Dative covert head	opp-datacc = hierarchy opposing dative-accusative mismatch	mat-datdat = dative match

The match conditions consist of accusative match (mat-accacc, see (5.10a)) and dative match (mat-datdat, see (5.10b)). The mismatch conditions are hierarchy harmonic mismatch (the covert head in the matrix clause is an accusative and the relative pronoun is a dative; har-accdat, see (5.10c)) and hierarchy opposing mismatch (the covert head in the matrix clause is a dative and the relative pronoun is an accusative; opp-datacc, see 5.10d)).

The case mentioned first is always the case of the covert head ($case_{matrix}$) in the matrix clause while the case mentioned second is always the case of the relative pronoun ($case_{relative}$). The test material for this experiment was generated according to the guidelines in (5.8). Examples are provided in (5.10):

(5.10) Examples for the four conditions in EXP 1 (superscripts provide sentence positions for analysis)

a. accusative match (mat-accacc) [65]

Der Vater umarmte ___, wen[1] der[2] Sohn[3] letztens[4] korrigiert[5] hatte[6].

the father hugged ___$_{acc}$ whom$_{acc}$ the$_{nom}$ son$_{nom}$ recently corrected had

'The father hugged who the son had recently corrected.'

b. dative match (mat-datdat)

Der Vater half ___, wem[1] der [2] Sohn[3] letztens[4] vertraut[5] hatte[6].

the father helped ___$_{dat}$ whom$_{dat}$ the$_{nom}$ son$_{nom}$ recently trusted had

'The father helped whom the son had recently trusted.'

c. hierarchy harmonic accusative-dative mismatch (har-accdat)

Der Vater umarmte ___, wem[1] der [2] Sohn[3] letztens[4] vertraut[5] hatte[6].

the father hugged ___$_{acc}$ whom$_{dat}$ the$_{nom}$ son$_{nom}$ recently trusted had

'The father hugged whom the son had recently trusted.'

d. hierarchy opposing dative-accusative mismatch (opp-datacc)

Der Vater half ___, wen[1] der[2] Sohn[3] letztens[4] korrigiert[5] hatte[6].

the father helped ___$_{dat}$ whom$_{acc}$ the$_{nom}$ son$_{nom}$ recently corrected had

'The father helped, whom the son had recently corrected.'

Each condition in (5.10) has 40 lexicalizations. Owing to a lack of suitable dative verbs meeting the requirements in (5.8, specifically in b, c, g, h, i), they had to be used twice in matrix clauses and free relative clauses. To compensate for this duplication segments of the test items independent of the experimental manipulation were adapted in the fillers. This distracts the participant from the possibly suspicious duplication as it is not special to the test items. The sentence positions (one for each word) of the free relative clauses are indicated in the superscript in (5.10) above.

[65] The blank was not presented to the participants in the experiments. It is included in the examples for illustrative purposes.

5.2.2. Hypotheses

The general predictions for all three experiments were given in (5.4)–(5.6). For transparency they are provided below in (5.11)–(5.13) adjusted according to the conditions of the current experiment (see 5.8). Both (5.11) and (5.12) predict effects that may localize earliest at the relative pronoun or its immediate spill-over region and may endure up to the sentence ending, whereas (5.13) also includes specific effects emerging no earlier than at the position of the critical verb. It can be assumed that any processing cost would occur first at the relative pronoun (Position 1) itself and possibly at the critical verb of the the free relative clause verb (Position 5; especially regarding (5.13)). Note that effects may also occur in the spill-over regions that were introduced in the test material.

(5.11) Predictions by SUBSET:
Hierarchy opposing dative-accusative mismatch (opp-datacc) elicit longer reading times on the relative pronoun than hierarchy harmonic accusative-dative mismatch (har-accdat).

(5.12) Predictions by SPECIFICITY:
Hierarchy opposing dative-accusative mismatch (opp-datacc) and hierarchy harmonic accusative-dative mismatch (har-accdat) elicit longer reading times on the relative pronoun than accusative match (mat-accacc) and dative match (mat-datdat).

(5.13) Predictions by No-PATIENT-RelPron:
a. Relative pronouns marked with accusative case will induce higher processing costs vis-à-vis relative pronoun marked with dative case before encountering the critical verb. More specifically, accusative match (mat-accacc) and hierarchy opposing dative-accusative mismatch (opp-datacc) elicit longer reading times on the relative pronoun than dative match (mat-datdat) and hierarchy harmonic accusative dative mismatch (har-accdat).
b. After encountering the critical verb, there is no reading time difference between the conditions.

The constraint SUBSET provides a prediction (5.11) for case mismatch conditions. The hierarchy harmonic accusative-dative mismatch (har-accdat) obeys SUBSET as the set of case features of the covert head is a subset of the set of case features of the relative pronoun. But this is not true for the hierarchy opposing dative-accusative mismatch (opp-datacc). Thus, the hierarchy harmonic accusative-dative mismatch (har-accdat) is predicted to be read significantly faster than the hierarchy opposing dative-accusative mismatch (opp-datacc). The constraint SPECIFICITY provides a prediction (5.12) for case match and case mismatch conditions. It predicts match conditions (mat-accacc and mat-datdat) to be read significantly faster than mismatch conditions (har-accdat and opp-datacc) because the match conditions obey SPECIFICITY and the mismatch conditions do not. Predictions by the constraint No-PATIENT-RelPron (5.13) first refer to the relative pronoun. Before the critical verb is encountered (5.13a) the parser interprets the dative relative pronoun as a proto-agent. Thus, conditions with a dative relative pronoun (mat-datdat and har-accdat) are preferred over conditions with an unequivocally initial patient role which is an accusative relative pronoun (mat-accacc and opp-datacc). There is another prediction when the critical verb is encountered (5.13b). The violation of No-PATIENT-RelPron by the dative match (mat-datdat) and the harmonic mismatch (har-accdat) becomes apparent at Position 5 (critical verb) because no verbs licensing dative proto-agents are included in the test material. Thus, at Position 5 (full verb) it is obvious to the human parser that this constraint is violated by all conditions in this experiment and they are not predicted to differ from each other.

5.2.3. Participants

In total, 96 monolingual German native speakers (12 per list) participated in the experiment (mean age: 21,16 years; 85 female) after giving written informed consent. The experiment is in line with the Declaration of Helsinki and with the national and institutional recommendations adopted by the Experimental Linguistics Lab in Cologne (XLinC lab). The participants had normal or corrected to normal vision. They were either paid for their participation or received course credit. They were not familiar with the purpose of the experiment.

5.2.4. Procedure

The self-paced reading experiment was programmed and executed using OpenSesame (Mathôt et al. 2012). The sentences were displayed in the horizontal center of a 20'' screen (by Dell) on a Dell-computer (operating system: Ubuntu) using a non-cumulative linear word-by-word presentation. They were presented in the font mono (23p) as black letters on a white background. Participants received written explanations for the procedure of the experiment. They further read four trial sentences and had the chance to ask any remaining questions concerning the procedure of the experiment. Every participant read 20 test sentences (five per condition) and 58 filler sentences in a pseudo-randomized order. After reading the sentences participants were asked to click *yes* to continue or to answer a *yes*/*no* comprehension question (e.g. *'Did the father frighten someone?'*). Participants provided their answers on a standard German computer keyboard (by Genius) with the letter *y* meaning *no* and the comma meaning *yes*. They could not anticipate whether they will be asked to click *yes* to continue or to answer a *yes*/*no* comprehension question. They had to complete this task within five seconds. After 26 and 52 sentences participants were asked to take a short break (at least 10 sec) by OpenSesame.

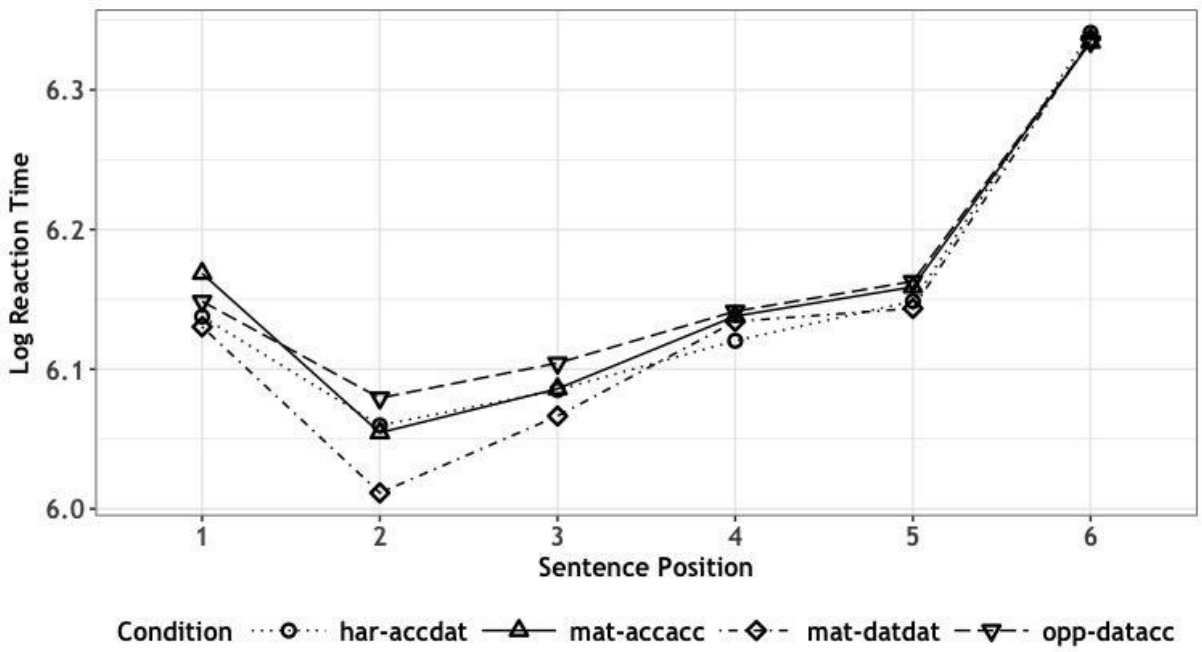
The entire experimental session lasted about 20-30 minutes. On average participants scored 94,09% correct responses in the comprehension task confirming that they attentively read the sentences.

5.2.5. Results[66]

Figure 1 provides the mean log reaction times corresponding to the sentence position. The sentence positions 1-6 correspond to the superscripts on the German test material in the example (5.10a-d). Note that in the current experiment Position 2 is a case-unambiguous nominative article (*der*) and Position 3 is a post-case noun (see (5.10a-d).

Figure 5.1: Logarithmized reaction time data on individually measured positions

[66] I thank Tim Graf and Franziska Kretzschmar for helping me with the statistical analysis of all three experiments of this thesis. All remaining errors are mine.



Before analysis, reaction time outliers that differed more than two standard deviations from a participant's mean per condition were excluded from analysis. Statistical analyses were performed in R (version 3.3.1., RStudio Team 2015) with the lme4 package (version 1.1-12, Bates et al. 2015). A linear mixed-effects model with the fixed factor CASE and random intercepts for participants and items was fitted to statistically analyze logarithmized reaction times with the following syntax: lmer(log(rt) ~ case + (1|participant) + (1|item). As specifying two fixed factors following the 2x2 design described in the item construction (see Chapter 5.2.1 above) resulted a rank-deficient model only one fixed factor CASE with four levels corresponding to the four critical conditions was specified. Contrasts for the fixed factor was encoded with treatment coding. Treatment coding was chosen because the hypotheses focus on pairwise comparisons (simple effects) and not simply on the main effect of case. Intercepts models with random slopes for case did not converge. Following convention, we treat t > 2 as significant (cf. Baayen et al. 2008). The first region of interest is the relative pronoun (position 1) and its spill-over region (position 2 and 3). Recall that it was assumed that any processing cost would occur first at the relative pronoun (Position 1) itself and possibly on the critical verb of the free relative clause (Position 5). Further, effects caused by these Positions may be measured (only) in their respective spill-over regions. Thus, given this robustness of spill-over effects with self-paced reading we also analyzed the spill-over regions following the relative pronoun (Positions 2 and 3) and the critical verb (Position 6).

Only in the spill-over regions of the relative pronouns (Positions 2 and 3) significant reading time differences occurred. At Position 2, the dative match was read significantly faster than the accusative match (mat-accacc vs. mat-datdat; t= 3.25). The dative match was also read significantly faster than the hierarchy harmonic case mismatch (mat-datdat vs. har-accdat; t= -3.64) and the hierarchy opposing case mismatch (mat-datdat vs. opp-datacc; t= 5.07). Thus, at Position 2, the dative match was read significantly faster than the other conditions. The other conditions did not reveal any significant reading time differences relative to each other. At Position 3, the only significant reading time difference was found for the dative match which was read faster than the opposing mismatch (mat-datdat vs. opp-datacc; t = 2.56). At the positions of the critical verb and the following auxiliary, there were no significant differences between the conditions. Table 5.1-5.3 provide the coefficients of the fixed effects for all positions with significant reading times differences. Table 5.4 provides an overview of the results of this experiment.

Table 5.1: coefficients of the fixed effects for Position 2 and 3 (spill-over regions of the relative pronoun), reference level: mat-datdat

	Position 2 (article)			**Position 3 (noun)**		
	Estimate	**Std. Error**	**t-value**	**Estimate**	**Std. Error**	**t-value**
Intercept	6.00796	0.02406	249.69	6.06670	0.02754	220.25
mat-accacc	0.04516	0.01388	3.25	0.01492	0.01597	0.93
har-accdat	0.05078	0.01396	3.64	0.01759	0.01601	1.10
opp-datacc	0.07092	0.01399	5.07	0.04105	0.01602	2.56

Table 5.2: coefficients of the fixed effects for Position 2 (spill-over regions of the relative pronoun), reference level: mat-accacc

	Position 2 (article)		
	Estimate	**Std. Error**	**t-value**
Intercept	6.053396	0.023024	262.91
mat-datdat	-0.045829	0.014671	-3.12
har-accdat	0.006284	0.015916	0.39
opp-datacc	0.024405	0.015115	1.61

Table 5.3: coefficients of the fixed effects for Position 2 and 3 (spill-over regions of the relative pronoun), reference level: opp-accdat

	Position 2 (article)			**Position 3 (noun)**		
	Estimate	**Std. Error**	**t-value**	**Estimate**	**Std. Error**	**t-value**
Intercept	6.07888	0.02413	251.96	6.10775	0.02759	221.34
mat-accacc	-0.02576	0.01399	-1.84	-0.02613	0.01607	-1.63
mat-datdat	-0.07092	0.01399	5.07	-0.04105	0.01602	-2.56
har-accdat	-0.02014	0.01407	-1.43	-0.02346	0.01608	-1.46

Table 5.4: Overview of all the significant reading times differences

Position 1 (relative pronoun)	no effect
Position 2 (first spill-over region)	mat-datdat < mat-accacc, har-accdat, opp-datacc
Position 3 (second spill-over region)	mat-datdat < opp-datacc
Position 4 (third spill-over region)	no effect
Position 5 (critical verb)	no effect
Position 6 (first spill-over region)	no effect

5.2.6. Interim discussion for Experiment 1

In Chapter 2.2. (Morphosyntactic approach to case in free relative clauses) and Chapter 3.3. (Deconstructing the subject notion), three construction-independent, universal, violable preferences were postulated. These preferences are the Subset Preference, the Specificity Preference, and the Proto-Agent First Preference. They provide different partially conflicting predictions and were assumed to interact with each other. This interaction was modulated utilizing Optimality Theory (OT; discussed in Chapter 4.3. Introduction to Optimality Theory). As could be shown, the preferences can be transferred into constraints (SUBSET, SPECIFICITY, No-PATIENT-RelPron) to fit the OT-framework. The four basic assumptions of OT are applicable to the purpose of the current thesis. Let us now examine how the results of this first experiment (EXP 1) fit the theoretical background, as provided in the previous chapters. Importantly, none of the constraints alone can account for the results. Instead an interaction of them within the OT framework must be assumed.

The critical regions for analysis are the relative pronoun (Position 1) and the critical verb (Position 5). Self-paced reading shows a robustness in revealing the processing difficulties not exclusively in the critical region or even not in the critical region at all but rather one or two regions directly following the critical region. Therefore, the respective spill-over regions of the relative pronoun (Positions 2 and 3) and the verb (Position 6) must be considered.

Recall that the only significant reading time differences were found for Position 2 and Position 3. Position 2 is occupied with the case-unambiguous article of the noun phrase in the free relative clause (*der*$_{nom}$). Position 3 is occupied with the noun of the noun phrase in the free relative clause. Let us first consider the results of Position 2 in Tableau 5.1:

Tableau 5.1: OT analysis for Position 2

Input: $case_{matrix}$, $case_{relative}$	No-PATIENT-RelPron	SPECIFICITY	SUBSET
mat-accacc	*		
☞mat-datdat			
har-accdat		*	
opp-datacc	*	*	*

At Position 2, the dative match was read faster than the other three conditions. The other conditions did not differ from each other. These results can accurately be captured in Tableau 5.1. The dative match obeys all constraints. In contrast, the accusative match (mat-accacc) and the hierarchy opposing dative-accusative mismatch (opp-datacc) violate No-PATIENT-RelPron because the accusative relative pronoun unequivocally codes a proto-patient role. The constraint SPECIFICITY is violated by the mismatch conditions (har-accdat and opp-datacc) because the covert head does not bear the most specific set of case features compatible with the set of features of the relative pronoun. The hierarchy opposing dative-accusative mismatch (opp-datacc) additionally violates SUBSET as the set of case features of its covert head is not a subset of the set of case features of the relative pronoun. The only candidate that does not violate any constraint is the dative match (mat-datdat). It is the intrinsic winner. The dative match would be the optimal candidate in any ranking. As a result, ranking is irrelevant for Position 2. This is indicated by missing vertical lines in Tableau 5.1.

The results of Position 2 do not provide indication for a ranking of the constraints. Recall, however, that Chapter 4.3. (Introduction to Optimality Theory) argued for a logical ranking between SPECIFICITY and SUBSET. SUBSET, as it only requires the set of case features of the covert head to be a subset of the set of case features of the relative pronoun, must be ranked below SPECIFICITY, as SPECIFICITY requires the set of case features of the covert head to be the most specific of the compatible sets of case features of the relative pronoun (i.e. an identical set of case features as given in the match conditions). Consequently, any candidate obeying SPECIFICITY obeys SUBSET as well. Thus, this suggests the ranking SPECIFICITY >> SUBSET. This theoretical approach was corroborated by offline studies concerning free relative clauses (cf. Mewe 2014, Vogel & Frisch 2003, Vogel & Zugck 2003, Vogel 2011) as case match conditions always outperformed case mismatch conditions significantly. This ranking is also applicable for the results of Position 2 as they do not conflict with such a ranking. The results for Position 3, however, necessitate a ranking of constraints, see Tableau 5.2:

Tableau 5.2: OT analysis for Position 3

Input: $case_{matrix}$, $case_{relative}$	No- PATIENT-RelPron	SPECIFICITY	SUBSET
☞? mat-accacc	*		
☞ mat-datdat			
☞?har-accdat		*	
opp-datacc	*	*	*

Recall that a significant reading time difference was found only for the comparison between dative match (mat-datdat) and hierarchy opposing dative-accusative mismatch (opp-datacc). A reading difference between dative match (mat-datdat) and accusative match (mat-accacc), as well as hierarchy harmonic accusative-dative mismatch (har-accdat), did not hold to Position 3. By tying No-PATIENT-RelPron and SPECIFICITY, the dative match is no longer the intrinsic winner of the evaluation. Recall from Chapter 4.3. (Introduction to Optimality Theory) that tying constraints leads to two evaluations. In the first evaluation—i.e. No-PATIENT-RelPron >> SPECIFICITY—the dative match (mat-datdat) and the hierarchy

harmonic accusative-dative mismatch (har-accdat) are the winners. In the second evaluation—i.e. SPECIFICITY >> No-PATIENT-RelPron—the match conditions (mat-accacc and mat-datdat) are the winners. The tie between No-PATIENT-RelPron and SPECIFICITY results in three winners of the evaluation: accusative match (mat-accacc), dative match (mat-datdat), and harmonic mismatch (har-accdat). While this does not capture that only the dative match and the opposing mismatch differed significantly from each other at Position 3, it provides a close approximation to the statistical findings. The hierarchy opposing mismatch (opp-datacc) is an intrinsic loser in such a way that it is sorted out independent of the rank of the three constraints as it violates all of the constraints.

The discrepancy between the prediction of the OT analysis and the statistical results is indicated by the question mark on the accusative match (mat-accacc) and the hierarchy harmonic accusative-dative mismatch (har-accdat). This discrepancy may be explained by self-paced reading possibly not being time-sensitive enough to capture small processing differences as significant reading time differences between conditions. The results of EXP 3 will reveal that the ranking which captures the data best is the ranking provided in Tableau 5.2: No-PATIENT-RelPron and SPECIFICITY are tied and ranked above than SUBSET. SUBSET must be ranked below the constraint SPECIFICITY as it is the least specific of both constraints.[67]

An interesting result is the lack of significant reading time differences on the critical verb (Position 5) or its spill-over region (Position 6). No-PATIENT-RelPron prefers initial proto-agents. A dative relative pronoun can code a proto-agent while an accusative relative pronoun is unequivocally interpreted as a proto-patient. Thus, a dative relative pronoun obeys No-PATIENT-RelPron and does not elicit increased processing costs as long as the interpretation as a proto-agent can be held. In contrast, an accusative relative pronoun apparently violates No-PATIENT-RelPron immediately resulting in increased processing costs. When encountering the critical verb (Position 5) the initial interpretation of the dative relative pronoun coding a proto-agent role proves to be false. The conditions with a dative relative pronoun apparently do not obey No-PATIENT-RelPron anymore. Instead, they violate this constraint in the same matter in which conditions with accusative relative pronouns do. Consequently, the conditions with accusative and dative relative pronouns do not differ significantly from each other concerning reading times. This fits accurately with

[67] This is much in line with the Paninian Principle (Noyer: 1992: 104): "If one rule's structural description is contained in the other's, the rule with the more specific structural description applies first."

the lack of significant reading time differences between the dative-match (mat-datdat), the accusative match (mat-accacc), the hierarchy opposing dative-accusative mismatch (opp-datacc), and the hierarchy harmonic accusative-dative mismatch (har-accdat).

Additionally, a methodological finding needs to addressed. The first position with significant reading time differences is Position 2 which is the case-unambiguous article (*der*) of the following noun phrase. For the time being, it is unclear if the effects on this region can be attributed to the relative pronoun (Position 1) which position 2 is the spill-over region of. It might alternatively be attributed to the incoming new case information of the article at Position 2. Experiment 2 accounted for this by a slightly altering the word order (which was also adopted in Experiment 3). In the current experiment, the relative pronoun was immediately followed by a noun phrase including an article (see test material in 8). In the following experiments, the modifier (adverb) will be moved from a position after the noun phrase of the free relative clause (Position 4) to between the relative pronoun and the noun phrase of the free relative clause (Position 2). This provides a greater distance between different pieces of case information in the free relative clause and makes attribution of the effects caused by $case_{relative}$ unequivocal. As will be shown in Experiment 2, the first position with significant reading time differences remains Position 2, irrelevant of whether an adverb or a case marked article is provided. This supports the effects found in the current experiment and can be ascribed to the experimental manipulation rather than to new case information pieces entering the incremental processing during sentence comprehension.

5.3. Experiment 2 (EXP 2; nom, acc)

5.3.1. Material and design

The second experiment (EXP 2) is concerned with the nominative and accusative cases. There were 160 test items (40 for each condition) distributed over eight lists (following a Latin Square design) and 58 filler sentences used in each list. As in EXP 1, sentences were constructed following a 2 (case match vs. case mismatch) x2 (nominative covert head vs.

accusative covert head) design in order to compare all case combinations with each other, provided in (5.14)[68]:

(5.14) Experiment design

	Case Mismatch	**Case Match**
Nominative covert head	har-nomacc = hierarchy harmonic nominative-accusative mismatch	mat-nomnom = nominative match
Accusative covert head	opp-accnom = hierarchy opposing accusative-nominative mismatch	mat-accacc = accusative match

The match conditions consist of nominative match (mat-nomnom, see (5.15a)) and accusative match (mat-accacc, see (5.15b)). The mismatch conditions are hierarchy harmonic mismatch (the covert head in the matrix clause is a nominative and the relative pronoun is an accusative; har-nomacc, see (5.15c)) and hierarchy opposing mismatch (the covert head in the matrix clause is an accusative and the relative pronoun is a nominative; opp-accnom, see 5.15d)). The test material for this experiment was generated according to the guideline in (5.8) above (5.2.1. Material and design). Examples are provided in (5.15) below; the sentence positions (one for each word) of free relative clauses are indicated in the superscript.:[69]

(5.15) Examples for the four conditions in EXP 2

a. nominative match (mat-nomnom)

Keine Geduld besaß ___,	*wer*[1]	*letztens*[2]	*den*[3]	*Sohn*[4]	*korrigiert*[5]	*hatte*[6].
no patience had	___$_{nom}$	who$_{nom}$ recently	the$_{acc}$	son$_{acc}$	corrected	had

'No patience had who had recently corrected the son.'

[68] Note that, as in EXP 1, these factors are not fully orthogonal in that the case combination in each cell only occur in one of the two levels. Therefore the statistical model will use a single factor design.

[69] All test items and fillers are provided in the Appendix.

b. accusative match (mat-accacc)

Der Vater umarmte ___, wen[1] letztens[2] der[3] Sohn[4] korrigiert[5] hatte[6].

the father hugged ___$_{acc}$ whom$_{acc}$ recently the$_{nom}$ son$_{nom}$ corrected had

'The father hugged, whom the son had recently corrected.'

c. hierarchy harmonic nominative-accusative mismatch (har-nomacc)

Keine Geduld besaß ___, wen[1] letztens[2] der[3] Sohn[4] korrigiert[5] hatte[6].

no patience had ___$_{nom}$ whom$_{acc}$ recently the$_{nom}$ son$_{nom}$ corrected had

'No patience had whom the son had recently corrected.'

d. hierarchy opposing accusative-nominative mismatch (opp-accnom)

Der Vater umarmte___, wer[1] letztens[2] den[3] Sohn[4] korrigiert[5] hatte[6].

the father hugged ___$_{acc}$ who$_{nom}$ recently the$_{acc}$ son$_{acc}$ corrected had

'The father hugged who had recently corrected the son.'

Each condition was lexicalized with 40 items. Matrix verbs governing nominatives were intransitive and transitive verbs. Therefore, both are included in the test material. For the previous experiment (EXP 1), it was necessary to double the dative verbs in each condition due to a lack of suitable verbs. To balance out the reduplication of the verbs the filler sentences partly duplicated the test items concerning content. This strategy was continued to be used in the current experiment to keep the fillers consistent. This ensures the similarity and comparability of the experiments. The fillers in EXP 1 contained accusative and dative arguments to disguise the test items. For the current experiment these verbs had to be altered to nominative and dative arguments to disguise the current experimental material. Otherwise, the fillers were kept similar. Again, further distraction from the critical constructions was created by the introduction of sentences with homonyms which lead participants into garden path like sentences.

As can be seen by comparing the examples for the test items provided in (5.10, EXP 1) and in (5.15, EXP 2) and as mentioned in the end of the discussion of EXP 1, the test material slightly differs (5.16)–(5.17):

(5.16) Changes in word order

In EXP 1, the noun phrase (Position 2: article and Position 3: noun) of the free relative clause directly followed the relative pronoun as it functioned as a spill-over region. This is the region where significant effects were revealed. To make sure that this effect did not occur due to the case information borne by the noun phrase, material without case information was used for EXP 2 (and EXP 3). Whereas in EXP 1, an adverb was placed between the free relative clause's noun phrase and the verb, for EXP 2, the adverb was placed between the relative pronoun and the NP. This ensures a case-unrelated spill-over region. Hence, the origin of an effect in this region (Position 2) can only be solely attributed to the experimental manipulation.

(5.17) Case alternation of the full noun phrase in the free relative clause

In EXP 1, only $case_{relative}$ was altered depending on the condition. The case of the noun phrase in the free relative clause remained the same (nominative). This was possible for dative and accusative relative pronouns. For the cases involved in the current experiment (nominative, accusative), this is not possible. The nominative case is the default for subjects and double nominatives are ungrammatical in German (with few exceptions). Therefore, in conditions with a nominative relative pronoun the case of the following NP was accusative (see test material in 5.10a and d).

5.3.2. Hypotheses

For transparency, hypotheses are provided below in (5.18)–(5.20) based on the constraints identified to operate in German free relative clauses (which are based on the preferences for the German free relative clauses postulated in this thesis). As in EXP 1, both (5.18) and (5.19) predict effects that may localize earliest at the relative pronoun or its immediate spill-over region and may endure up to the sentence ending, whereas (5.20) also includes specific effects emerging no earlier than at the position of the critical verb. It can be assumed that any processing cost would occur first at the relative pronoun (Position 1) itself and possibly on the critical verb in the free relative clause (Position 5; especially regarding (5.20)). Note that effects may also occur in the spill-over regions that were introduced in the test material. Predictions are slightly adjusted according to the conditions of the current experiment:

(5.18) Predictions by the SUBSET:

Hierarchy opposing accusative-nominative mismatch (opp-accnom) elicit longer reading times on the relative pronoun than hierarchy harmonic nominative-accusative mismatch (har-nomacc).

(5.19) Predictions by SPECIFICITY:

Hierarchy opposing accusative-nominative mismatch (opp-accnom) and hierarchy harmonic nominative-accusative mismatch (har-nomacc) elicit longer reading times on the relative pronoun than nominative match (mat-nomnom) and accusative match (mat-accacc).

(5.20) Predictions by the No-PATIENT-RelPron:

Accusative match (mat-accacc) and hierarchy harmonic nominative-accusative mismatch (har-nomacc) elicit longer reading times on the relative pronoun and the critical verb than nominative match (mat-nomnom) and hierarchy opposing accusative-nominative mismatch (opp-accnom).

The constraint SUBSET provides predictions (5.18) for the mismatch conditions. The hierarchy harmonic nominative-accusative mismatch (har-nomacc) is predicted to be read significantly faster than the hierarchy opposing accusative-nominative mismatch (opp-accnom). This can be attributed to the fact that the hierarchy harmonic nominative-accusative mismatch (har-nomacc) obeys SUBSET because the set of case features of the covert head is a subset of the set of case features of the relative pronoun. In contrast, the hierarchy opposing accusative-nominative mismatch (opp-accnom) violates this constraint because the set of case features of the covert head is a not subset of the set of case features of the relative pronoun.

The constraint SPECIFICITY provides a prediction (5.19) for case match and case mismatch conditions. Case match conditions obey this constraint while case mismatch conditions violate this constraint. Thus, match conditions (mat-nomnom and mat-accacc) are predicted to be read significantly faster than mismatch conditions. Predictions by the constraint No-PATIENT-RelPron (5.20) refer solely to the relative pronoun. Conditions with an initial nominative in the free relative clause (mat-nomnom and opp-accnom) are

preferred over conditions with a case coding a patient role—i.e. accusative (mat-accacc and har-nomacc)—because a nominative may code a proto-agent while an accusative cannot.

5.3.3. Participants

96 monolingual German native speakers participated in this experiment under the same conditions, as described in EXP 1 (mean age: 21,94 years; 78 female). None of them took part in EXP 1.

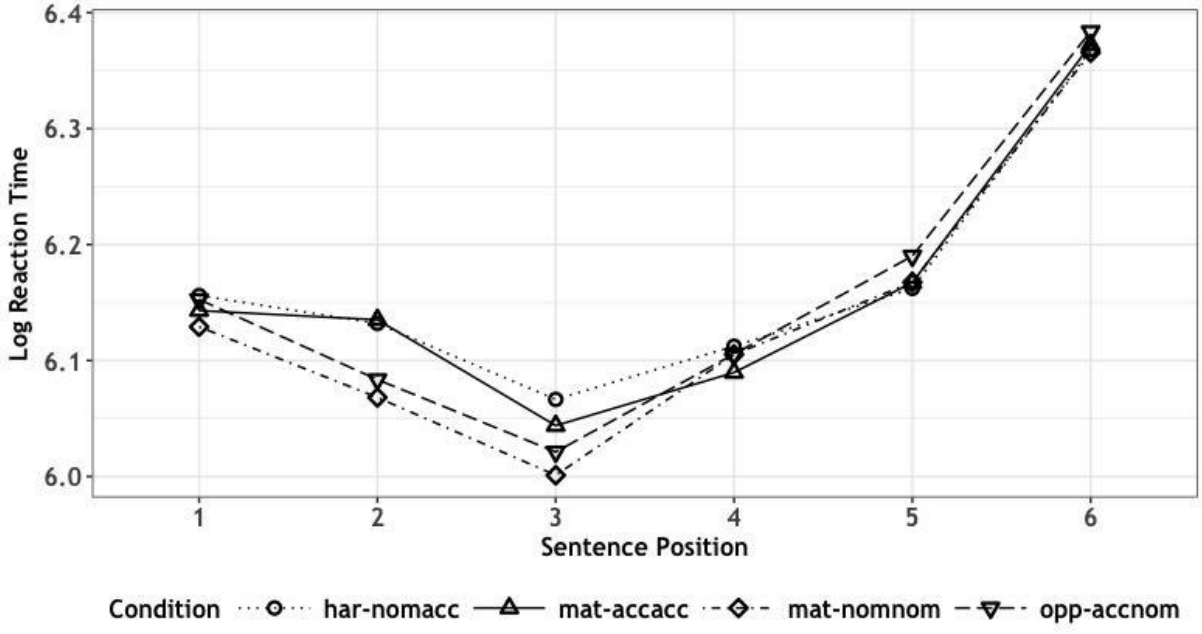
5.3.4. Procedure

The procedure was identical to EXP 1 to keep the experiments comparable.

5.3.5. Results

Figure 5.2 provides the mean log reaction times corresponding to the sentence position. The sentence positions 1-6 correspond to the superscripts on the German test material in the example (5.15a-d). Note that in the current experiment, Position 2 is an adverb and Position 3 is a case-unambiguous article (*der*$_{nom}$*/ den*$_{acc}$, see (5.15a-d).

Figure 5.2: Logarithmized reaction times data on individually measured sentence positions



As in EXP 1, before analysis reaction time outliers that differed more than two standard deviations from a participant's mean per condition were excluded from analysis. Statistical analyses were performed in R (version 3.3.1., RStudio Team 2015) with the lme4 package (version 1.1-12, Bates et al. 2015). The same statistical modeling approach as for EXP 1 was used for statistical analysis. A linear mixed-effects model with the fixed factor CASE and random intercepts for the participants and items (lmer(log(rt) ~ case + (1|participant) + (1|item)). As specifying two fixed factors following the 2x2 design resulted a rank-deficient model (as discussed concerning EXP 1) only one fixed factor CASE with four levels corresponding to the four critical conditions was specified. Again, treatment coding was chosen. Intercept models with random slopes for case did not converge and $t > 2$ was set as significant.

At Position 2, the match conditions revealed a significant reading time difference. The nominative match was read faster than the accusative match (mat-nomnom vs. mat-accacc; t= -4.52). The nominative match further revealed significantly faster reading times than the hierarchy harmonic case mismatch (mat-nomnom vs. har-nomacc; t= 4.14). The accusative match was read significantly slower than the hierarchy opposing mismatch (mat-accacc vs. opp-accnom, t= 3.64). The case mismatches also differed significantly from each other with the hierarchy opposing case mismatch being read faster than the hierarchy harmonic mismatch (har-nomacc vs. opp-nomacc; t= 3.27).

At Position 3, the difference between the case match conditions persisted as the nominative case match was read significantly faster than the accusative case match (mat-nomnom vs. mat-accacc; t= 3.03). Further, the nominative match was still read significantly faster than the harmonic mismatch (mat-nomnom vs. har-nomacc; t= 4.92). The mismatch conditions continued to show a significant reaction time difference in favor of the opposing mismatch (har-nomacc vs. opp-accnom, t= -3.54).

At the positions of the critical verb (Position 5) and the following auxiliary (Position 6), there were no significant differences between the conditions. Table 5.5-5.7 provide the coefficients of the fixed effects for all positions with significant reading time differences. Table 5.8 provides an overview of the results of this experiment.

Table 5.5: coefficients of the fixed effects for Position 2 and 3 (spill-over regions of the relative pronoun), reference level: mat-nomnom

	Position 2 (adverb)			**Position 3 (article)**		
	Estimate	**Std. Error**	**t-value**	**Estimate**	**Std. Error**	**t-value**
Intercept	6.06423	0.02568	236.19	5.99687	0.02206	271.85
mat-accacc	0.06920	0.01532	4.52	0.04078	0.01348	3.03
har-nomacc	0.06382	0.01543	4.14	0.06612	0.01347	4.91
opp-accnom	0.01316	0.01533	0.86	0.01841	0.01347	1.37

Table 5.6: coefficients of the fixed effects for Position 2 and 3 (spill-over regions of the relative pronoun), reference level: mat-accacc

	Position 2 (adverb)			**Position 3 (article)**		
	Estimate	**Std. Error**	**t-value**	**Estimate**	**Std. Error**	**t-value**
Intercept	6.133423	0.025711	238.55	6.03765	0.02207	273.54
mat-nomnom	-0.069197	0.015325	-4.25	-0.04078	0.01348	-3.03
har-nomacc	-0.005378	0.015491	-0.35	0.02534	0.01349	1.88
opp-accnom	-0.056041	0.015387	-3.64	-0.02237	0.01349	-1.66

Table 5.7: coefficients of the fixed effects for Position 2 and 3 (spill-over regions of the relative pronoun), reference level: har-nomacc

	Position 2 (adverb)			**Position 3 (article)**		
	Estimate	**Std. Error**	**t-value**	**Estimate**	**Std. Error**	**t-value**
Intercept	6.08232	0.02213	274.87	6.06299	0.02206	274.87
mat-nomnom	-0.06612	0.01549	-4.94	-0.06612	0.01347	-4.91
mat-accacc	-0.02534	0.01332	-1.76	-0.02534	0.01349	-1.88
opp-accnom	-0.04771	0.01482	-4.23	-0.04771	0.01347	-3.54

Table 5.8: Overview of all the significant reading times differences

Position 1 (relative pronoun)	no effect
Position 2 (first spill-over region)	mat-nomnom, opp-accnom <mat-accacc, har-nomacc
Position 3 (second spill-over region)	mat-nomnom < mat-accacc, har-nomacc opp-accnom < har-nomacc
Position 4 (third spill-over region)	no effect
Position 5 (critical verb)	no effect
Position 6 (first spill-over region)	no effect

5.3.6. Interim discussion for Experiment 2

As in Experiment 1, none of the constraints postulated in this thesis can account for the results. Instead an interaction of them within the OT framework must be assumed. Similar to EXP 1, the critical regions are the relative pronoun (Position 1) and the critical verb (Position 5). Self-paced reading shows a robustness in revealing processing difficulties not exclusively in the critical region or even not in the critical region at all but rather one or two regions directly following the critical region. Therefore, the respective spill-over regions of the relative pronoun (Positions 2 and 3) and the verb (Position 6) must be considered.

Recall that the only significant reading time differences were found in Positions 2 and 3. Position 2 is occupied with an adverb. Position 3 is the case-unambiguous article of the noun phrase in the free relative clause (*der*$_{nom}$ for conditions with an accusative relative pronoun, mat-accacc and har-nomacc; *den*$_{acc}$ for conditions with a nominative relative pronoun, mat-nomnom and opp-accnom). The OT-analysis of the results for Positions 2 and 3 will be provided Tableau 5.3:

Tableau 5.3: OT analysis for Position 2 and 3

Input: $case_{matrix}$, $case_{relative}$	No-PATIENT-RelPron	SPECIFICITY	SUBSET
☞ mat-nomnom			
mat-accacc	*		
har-nomacc	*	*	
?opp-accnom		*	*

The nominative match (mat-nomnom) does not violate any constraints. The accusative match (mat-accacc) and the hierarchy harmonic nominative-accusative mismatch (har-nomacc) violate No-PATIENT-RelPron because their accusative relative pronoun unequivocally codes a proto-patient. The hierarchy harmonic nominative-accusative mismatch (har-nomacc) and the hierarchy opposing accusative-nominative mismatch (opp-accnom) violate SPECIFICITY as the set of case features of the covert head is not the most specific of the compatible sets of case features (i.e. not a match condition). SUBSET is violated only by the hierarchy opposing accusative-nominative mismatch (opp-accnom). In this condition the set of the case features of the covert head is no subset of the set of case

features of the relative pronoun. All other conditions (including the match conditions that obey SPECIFICITY) obey this constraint.

Since the nominative match (mat-nomnom) does not violate any of the constraints it is the intrinsic winner of this evaluation. This means that irrelevant of different rankings the nominative match is always the optimal candidate. This is indicated by missing lines between the constraints. Tableau 5.3 can mostly capture the results of Position 2. As predicted by Tableau 5.3, the nominative match revealed significantly faster reading times than the accusative match (mat-accacc) and the hierarchy harmonic nominative-accusative mismatch (har-nomacc). The comparison between nominative match (mat-nomnom) and hierarchy opposing accusative-nominative mismatch (opp-accnom) failed to reach any statistical significance. This discrepancy between the results of the OT analysis and those of the statistical analysis is indicated by a question mark in Tableau 5.3. As mentioned in the discussion of EXP 1, this discrepancy may be explained by self-paced reading the possibly not being time-sensitive enough to capture small processing differences as significant reading time differences between conditions. Interestingly, however, there was a numerical reading times increase from nominative match (mat-nomnom) to opposing accusative-nominative mismatch (opp-accnom). The opposing accusative-nominative mismatch was read significantly faster than the remaining two conditions (mat-accacc and har-nomacc). This cannot be captured by an OT analysis which yields mat-nomnom as the only optimal candidate.

While the results of Position 2 can mostly be captured by Tableau 5.3 the results of Position 3 can be captured precisely by Tableau 5.3. Recall that at Position 3 the conditions accusative match (mat-accacc), harmonic mismatch (har-nomacc), and opposing mismatch (opp-accnom) did not reveal any significant reading time differences relative to each other. This is fully reflected in Tableau 5.3. These three conditions are intrinsic losers in the evaluation because each condition violates at least one constraint, whereas the nominative match does not violate any constraints.

A methodological issue needs to be addressed at this point. In EXP 1, the first position with significant reading time differences is Position 2 which is the case-unambiguous article (*der*) of the following noun phrase. As mentioned in the interim discussion of EXP 1 (see Chapter 5.2.6.), the effect could not unequivocally be attributed to the experimental manipulation of the test material. It was speculated that this new case

information of the noun phrase's article might have influenced the effects found at Position 2. This is one of the reasons why for Experiment 2 (and 3) the material was slightly altered and the modifier (Position 2) was put in between the relative pronoun and the article (Position 3). The current experiment reveals that earliest effects continue to occur in the spill-over region immediately following the relative pronoun (Position 2). Thus, the measured reading time differences at Position 2 can be ascribed to the experimental manipulation of the test material; they are not contingent on the availability of the determiner of the noun phrase of the free relative clause

5.4. Experiment 3 (EXP 3; nom, dat)

5.4.1. Material and design

The third experiment (EXP 3) is concerned with the cases nominative and dative. There were 160 test items (40 for each condition) distributed over eight lists (following a Latin Square design) and 58 filler sentences used in each list. As in EXP 1 and 2, sentences were constructed following a 2 (case match vs. case mismatch) x2 (nominative covert head vs. dative covert head) design in order to compare all case combinations with each other, provided in (5.21): [70]

(5.21) Experiment design

	Case Mismatch	**Case Match**
Nominative covert head	har-nomdat = hierarchy harmonic nominative-dative mismatch	mat-nomnom = nominative match
Dative covert head	opp-datnom = hierarchy opposing dative-nominative mismatch	mat-datdat = dative match

[70] Note that, as in EXP 1 and 2, these factors are not fully orthogonal in that the case combination in each cell only occur in one of the two levels. Therefore the statistical model will use a single factor design.

The match conditions consist of nominative match (mat-nomnom, see (5.22)) and dative match (mat-datdat, see (5.22b)). The mismatch conditions are hierarchy harmonic mismatch (the covert head in the matrix clause is a nominative and the relative pronoun is a dative; har-nomdat, see (5.22c)) and hierarchy opposing mismatch (the covert head in the matrix clause is a dative and the relative pronoun is a nominative; opp-datnom, see 5.22d)). The test material for this experiment was generated according to the guideline given in 5.2.6. (Material and design). Slight modifications to Experiment 1 were kept identical to the modifications outlined in (5.8) in Experiment 2. Examples of the current test material is provided in (5.22):[71]

(5.22) Examples for the four conditions in EXP 3

a. nominative match (mat-nomnom)

Keine Geduld besaß ___, *wer*[1] *letztens*[2] *dem*[3] *Sohn*[4] *vertraut*[5] *hatte*[6].
no patience had ___$_{nom}$ who$_{nom}$ recently the$_{dat}$ son$_{dat}$ trusted had
'No patience had who had recently trusted the son.'

b. dative match (mat-datdat)

Der Vater half ___, *wem*[1] *letztens*[2] *der*[3] *Sohn*[4] *vertraut*[5] *hatte*[6].
the father helped ___$_{dat}$ whom$_{dat}$ recently the$_{nom}$ son$_{nom}$ trusted had
'The father helped whom the son had recently trusted.'

c. hierarchy harmonic nominative-dative mismatch (har-nomdat)

Keine Geduld besaß ___, *wem*[1] *letztens*[2] *der*[3] *Sohn*[4] *vertraut*[5] *hatte*[6].
no patience had ___$_{nom}$ whom$_{dat}$ recently the$_{nom}$ son$_{nom}$ trusted had
'No patience had whom the son had recently trusted.'

d. hierarchy opposing dative-nominative mismatch (opp-datnom)

Der Vater half ___, *wer*[1] *letztens*[2] *dem*[3] *Sohn*[4] *vertraut*[5] *hatte*[6].
the father helped ___$_{dat}$ who$_{nom}$ recently the$_{dat}$ son$_{dat}$ trusted had
'The father helped who had recently trusted the son.'

[71] All test items and fillers are provided in the Appendix.

The cases of fillers were adjusted accordingly. Otherwise, they remained the same. The sentence positions (one for each word) of the free relative clauses are indicated in the superscript.

5.4.2. Hypotheses

For transparency, hypotheses are provided below in (5.23)–(5.25) based on the constraints identified to operate in German free relative clauses (which are based on the preferences for German free relative clauses postulated in this thesis). As in EXP 1 and 2, both (5.23) and (5.24) predict effects that may localize earliest at the relative pronoun or its immediate spill-over region and may endure up to the sentence ending whereas (5.25) also includes specific effects emerging no earlier than at the position of the critical verb. It can be assumed that any processing cost would occur first at the relative pronoun (Position 1) itself and possibly on the critical verb in the free relative clause (Position 5; especially regarding (5.25)). Note that effects may also occur in the spill-over regions that were introduced in the test material. Predictions are adjusted according to the conditions of the current experiment (see (5.23)–(5.25)):

(5.23) Predictions by the SUBSET:
Hierarchy opposing dative-nominative mismatch (opp-datnom) elicit longer reading times on the relative pronoun than hierarchy harmonic nominative-dative mismatch (har-nomdat).

(5.24) Predictions by SPECIFICITY:
Hierarchy opposing dative-nominative mismatch (opp-datnom) and hierarchy harmonic nominative-dative mismatch (har-nomdat) elicit longer reading times on the relative pronoun than nominative match (mat-nomnom) and dative match (mat-datdat).

(5.25) Predictions by No-PATIENT-RelPron:
a. Before encountering the critical verb, no reading time difference occurs between the conditions.

b. After encountering the critical verb, dative match (mat-datdat) and hierarchy harmonic nominative-dative mismatch (har-nomdat) elicit longer reading times on the critical verb than nominative match (mat-nomnom) and hierarchy opposing dative-nominative mismatch (opp-datnom).

The constraint SUBSET (5.23) predicts that the hierarchy harmonic nominative-dative mismatch would be read faster than the hierarchy opposing dative-nominative mismatch because the former obeys SUBSET while the latter violates it. The constraint SPECIFICITY (5.24) predicts the match conditions (mat-nomnom and mat-datdat) will be read faster than the mismatch conditions (har-nomdat and opp-datnom). Recall, case match conditions always obey SPECIFICITY. Case mismatch conditions always violate this constraint. The predictions made by the constraint No-PATIENT-RelPron (5.25) must be regarded in more detail. Since the dative is involved in the current experiment, the different sentence positions must be considered (as in EXP1). Before the critical verb is encountered, the parser interprets the dative relative pronoun as a proto-agent. A nominative relative pronoun is also interpreted as proto-agents. Thus, at any position before Position 5 (full verb), No-PATIENT-RelPron should not cause differences in reading times between the conditions of the current experiment. The violation of this constraint by the dative match (mat-datdat) and the harmonic nominative-dative mismatch (opp-nomdat) becomes apparent at Position 5 (full verb) because all dative relative pronouns are patient-like in this study. At this point, there is a reanalysis of the thematic role of the dative relative pronoun. Thus, once the parser encounters the verb (position 5) and realizes that the conditions with a dative relative pronoun violate No-PATIENT-RelPron, conditions with nominative relative pronouns (mat-nomnom and opp-datnom) are preferred over conditions with dative relative pronouns (mat-datdat and har-nomdat).

5.4.3. Participants

96 monolingual German native speakers participated in the experiment under the same conditions as described in EXP 1 (mean age: 21,38 years; 79 female). None of them took part in EXP 1 or EXP 2.

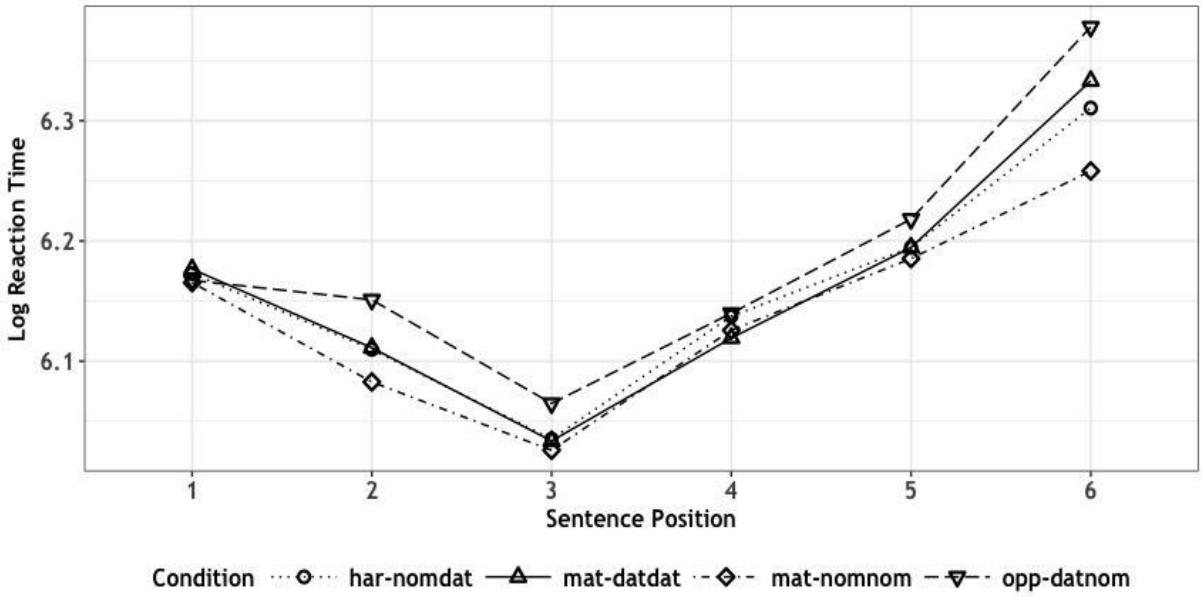
5.4.4. Procedure

The procedure was identical to EXP 1 to keep the experiments comparable.

5.4.5. Results[72]

Figure 5.2 provides the mean log reaction times corresponding to the sentence position. The sentence positions 1-6 correspond to the superscripts on the German test material in the example (5.22a-d). Again, the Positions 1–6 are provided as indices in superscript on the German test material in (5.22a.-d.).

Figure 5.3: Logarithmized reaction times data on individually measured sentence positions



As in EXP 1, before analysis, reaction time outliers that differed more than two standard deviations from a participant's mean per condition were excluded from analysis. Statistical analyses were performed in R (version 3.3.1., RStudio Team 2015) with the lme4 package (version 1.1-12, Bates et al. 2015). The same linear mixed-effects model used in the experiments before was used with the fixed factor CASE and random intercepts by the participants and items (lmer(log(rt) ~ case + (1|participant) + (1|item)). As specifying two fixed factors following the 2x2 design resulted a rank-deficient model (as discussed concerning EXP 1), only one fixed factor CASE with four levels corresponding to the four

[72] Vogel & Frisch (2003: 100) report no main effect of the matrix verb. Therefore, in this study reading times were measured starting with the relative pronoun.

critical conditions was specified. Again, treatment coding was chosen. Intercept models with random slopes for case did not converge and t > 2 was set as significant.

Positions 2 (P2) and 3 (P3) revealed identical reaction time differences. Therefore, they will be discussed together in the following. There were no reaction time differences between nominative match, dative match, and hierarchy harmonic nominative-dative mismatch. Instead, all these conditions differed significantly from the hierarchy opposing dative-nominative mismatch. The comparison between the nominative match and opposing mismatch shows the largest difference (mat-nomnom vs. opp-datnom; P2: t= -4.71; P3: t= -3.20), followed by the comparison between the dative match and the opposing mismatch (mat-datdat vs. opp-datnom; P2: t= 2.95; P3: t= 2.61), which is followed by the comparison between the harmonic mismatch and opposing mismatch (har-nomdat vs. opp-datnom; P2: t= 3.10; P3: t= 2.40). In contrast to EXP 1 and EXP 2, Position 6 (the spill-over region of the critical verb) revealed significant reading time differences. The match conditions differed from each other with the nominative match being read significantly faster than the dative match (mat-nomnom vs. mat-datdat, t= 3.25). The nominative match was also read significantly faster than the harmonic mismatch (mat-nomnom vs. har-nomdat, t= 2.40) and the opposing mismatch (mat-nomnom vs. opp-datnom, t= 4.91). A comparison between the mismatch conditions revealed that the harmonic mismatch was read significantly faster than the opposing mismatch (har-nomdat vs. opp-datnom, t= 2.52).

Table 5.9 - 5.14 provide the coefficients of the fixed effects for all positions with significant reading time differences. Table 5.15 provides an overview over the results of this this experiments.

Table 5.9: coefficients of the fixed effects for Position 2 and 3 (spill-over regions of the relative pronoun), reference level: mat-nomnom

	Position 2 (adverb)			**Position 3 (article)**		
	Estimate	**Std. Error**	**t value**	**Estimate**	**Std. Error**	**t value**
Intercept	6.08304	0.02520	241.35	6.025335	0.021863	275.60
mat-datdat	0.02586	0.01499	1.73	0.007371	0.012590	0.59
har-nomdat	0.2375	0.01496	1.59	0.010049	0.012549	0.80
opp-datnom	0.07010	0.01490	4.71	0.040313	0.012584	3.20

Table 5.10: coefficients of the fixed effects for Position 2 and 3 (spill-over regions of the relative pronoun), reference level: mat-datdat

	Position 2 (article)			**Position 3 (noun)**		
	Estimate	**Std. Error**	**t-value**	**Estimate**	**Std. Error**	**t-value**
Intercept	6.078643	0.026469	229.65	6.009696	0.023546	255.23
mat-nomnom	-0.015524	0.016349	-0.91	0.001047	0.013533	0.08
har-nomdat	0.006993	0.016418	0.43	0.009285	0.013545	0.69
opp-datnom	0.057108	0.016360	3.49	0.042507	0.013602	3.12

Table 5.11: coefficients of the fixed effects for Position 2 and 3 (spill-over regions of the relative pronoun), reference level: opp-datnom

	Position 2 (article)			**Position 3 (noun)**		
	Estimate	**Std. Error**	**t-value**	**Estimate**	**Std. Error**	**t-value**
Intercept	6.15314	0.02521	244.09	6.06565	0.02188	277.18
mat-nomnom	-0.07010	0.01490	-4.71	-0.04031	0.01258	-3.20
mat-datdat	-0.04424	0.01500	-2.95	-0.03294	0.01263	-2.61
har-nomdat	-0.04635	0.01497	-3.10	-0.03026	0.01258	-2.40

Table 5.12: coefficients of the fixed effects for Position 6 (critical verb and its spill-over region), reference level: mat-nomnom

	Position 6 (auxiliary)		
	Estimate	**Std. Error**	**t value**
Intercept	6.25537	0.03836	163.07
mat-datdat	0.07570	0.02331	3.25
har-nomdat	0.05592	0.02334	2.40
opp-datnom	0.11527	0.02349	4.91

Table 5.13: coefficients of the fixed effects for Position 6 (spill-over regions of the relative pronoun), reference level: mat-datdat

	Position 6 (auxiliary)		
	Estimate	**Std. Error**	**t-value**
Intercept	6.33107	0.0808	164.97
mat-nomnom	-0.07570	0.02331	-3.25
har-nomdat	-0.01970	0.02337	-0.58
opp-datnom	0.03957	0.02351	1.68

Table 5.14: coefficients of the fixed effects for Position 6 (spill-over regions of the relative pronoun), reference level: opp-datnom

	Position 6 (auxiliary)		
	Estimate	**Std. Error**	**t-value**
Intercept	6.37064	0.03848	165.55
mat-nomnom	-0.11527	0.02349	-4.91
mat-datdat	-0.03957	0.02352	-1.68
har-nomdat	-0.05935	0.02354	-2.52

Table 5.15: Overview of all the significant reading times differences

Position 1 (relative pronoun)	no effect
Position 2 (first spill-over region)	mat-nomnom, mat-datdat, har-nomdat < opp-datnom
Position 3 (second spill-over region)	mat-nomnom, mat-datdat, har-nomdat < opp-dat
Position 4 (third spill-over region)	no effect
Position 5 (critical verb)	no effect
Position 6 (first spill-over region)	mat-nomnom < mat-datdat har-nomdat < opp-datnom

5.4.6. Interim discussion for Experiment 3

As in Experiment 1 and 2, none of the constraints postulated in this thesis alone can account for the results. Instead, an interaction of them within the OT framework must be assumed. The critical regions of this study are the relative pronoun (Position 1) and the critical verb (Position 5), completed by spill-over regions of the relative pronoun (Positions 2 and 3) and the verb (Position 6).

Let us begin with interpreting the results of Positions 2 and 3. Position 2 is occupied with an adverb. Position 3 is the case-unambiguous article of the noun phrase in the free relative clause (*der*$_{nom}$ for conditions with and dative relative pronoun, mat-datdat, and har-nomdat; *dem*$_{dat}$ for conditions with a nominative relative pronoun, mat-nomnom, and opp-datnom). Since their results concerning statistically significant difference are identical, they will be presented in combination in Tableau 5.4:

Tableau 5.4: OT analysis for position 2 and 3

Input: $case_{matrix}$, $case_{relative}$	No-PATIENT-RelPron	SPECIFICITY	SUBSET
☞ mat-nomnom			
☞ mat-datdat			
☞ har-nomdat		*	
opp-datnom		*	*

The statistical results are captured most fittingly by assuming two tied constraints — No-PATIENT-RelPron and SPECIFICITY — which are ranked over SUBSET. Tying two constraints results in two evaluations. In the first evaluation, No-PATIENT-RelPron >> SPECIFICITY, no candidate can be eliminated due to violation of No-PATIENT-RelPron because one of the candidates violates No-PATIENT-RelPron at Position 2 or 3. Nominative relative pronouns can unequivocally code a proto-agent. The interpretation of initial dative relative pronouns as proto-agents can also be held at this point because the critical verb was not encountered yet. Hence, No-PATIENT-RelPron does not cause any candidate to leave the evaluation for the time being. In the second evaluation, SPECIFICITY >> No-PATIENT-RelPron, the nominative match (mat-nomnom) and the dative match (mat-datdat) obey SPECIFICITY as their respective covert heads and relative pronouns share an identical set of case features, and therefore, the set of case features of the covert heads are the most specific of the compatible sets of features. In contrast, the hierarchy harmonic nominative-dative mismatch (har-nomdat) and the hierarchy opposing dative-nominative mismatch (opp-datnom) violate this constraint. Thus, the reading time difference between the hierarchy opposing mismatch (opp-datnom) and the match conditions (mat-nomnom and mat-datdat) can be captured in Tableau 5.4. Turning to the mismatch conditions, the hierarchy opposing dative-nominative mismatch (opp-datnom) violates the lowest ranked constraint SUBSET because the set of case features of its covert head is not a subset of the set of case features of its relative pronoun but rather vice versa. In contrast, the hierarchy harmonic nominative-dative mismatch (har-nomdat) obeys SUBSET. Thus, Tableau 5.4 accurately captures the reading time difference found between the case mismatches with the hierarchy harmonic nominative-dative mismatch (har-nomdat) being read faster.

A result that cannot be captured by Tableau 5.4 is that although the hierarchy harmonic nominative-dative mismatch (har-nomdat) violates SPECIFICITY, it does not result in a statistically significant reading time increase. It only results in a numerical reading time increase compared to the match conditions. As explained in the discussions of EXP 1 and 2, failure to reach significant reading time differences may be attributed to self-paced reading possibly not being time-sensitive enough to capture small processing differences as significant reading time differences between conditions.

The results of Positions 2 and 3 of the current experiment reveal one crucial finding: As mentioned above, the tie between NO-PATIENT-RelPron and SPECIFICITY does not lead to the elimination of any candidate. Only owing to SUBSET, the hierarchy opposing dative-nominative mismatch is eliminated. This is in line with the statistical results: The hierarchy opposing dative-nominative mismatch (opp-datnom) is the only condition that is read significantly slower than the other conditions. Importantly, while the interpretation of the results of Positions 2 and 3 in EXP 1 and EXP 2 relied on all constraints, the results of Positions 2 and 3 in EXP 3 can be explained solely by this constraint. This finding is remarkable as it ties in with previous results from offline data centering the Case Hierarchy Rule that SUBSET can account for (see Chapter 2.1.2. Case Hierarchy Rule in free relative clauses and Chapter 2.2. Morphosyntactic approach to case in free relative clauses).

Another remarkable finding of this experiment is the reading time difference found at Position 6, the spill-over region of the critical verb (Position 5). This verb reveals that dative relative pronouns, in fact, are not proto-agents, as assumed by the human language processor before encountering the critical verb but rather patient-like. This means that for the conditions with a dative relative pronoun (mat-datdat and har-nomdat) the assumption of a dative proto-agent cannot be held as no verbs in the test material licenses such agentive roles for dative relative pronouns in the conditions. Consequently, the interpretation of an initial dative proto-agent needs to be revised to a patient-like role for conditions with dative relative pronouns. At Position 5, it becomes apparent that these conditions violate No-PATIENT-RelPron. This is convincingly reflected in the results in the spill-over region of Position 5 (given in Tableau 5.5):

Tableau 5.5: OT analysis for Position 6

Input: $case_{matrix}$, $case_{relative}$	No-PATIENT-RelPron	SPECIFICITY	SUBSET
☞ mat-nomnom			
mat-datdat	*		
har-nomdat	*	*	
opp-datnom		*	*

As in EXP 1 (Position 3, see Tableau 5.2) and EXP 3 (Positions 2 and 3, see Tableau 5.4), tied constraints are assumed: No-PATIENT-RelPron and SPECIFICITY. As mentioned above, an interpretation as a proto-agent for dative relative pronouns can no longer be held since the verb at Position 5 reveals that they are patient-like. Thus, No-PATIENT-RelPron, which could not eliminate any condition at Position 2 or 3, gains relevance. The locally tied constraints lead to two evaluations. In the first evaluation, No-PATIENT-RelPron >> SPECIFICITY, the nominative match (mat-nomnom) and the hierarchy opposing dative-nominative mismatch (opp-datnom) are the winners because their initial nominative relative pronoun is in line with No-PATIENT-RelPron favoring an initial proto-agent. Conditions with dative relative pronouns were revealed to violate this constraint at this point. In the second evaluation, SPECIFICITY >> No-PATIENT-RelPron, the two match conditions (mat-nomnom and mat-datdat) are the winners because they obey SPECIFICITY due to the set of case features of their respective covert heads being the most specific of the compatible sets of case features of their respective relative pronoun. This is not true for case mismatches. That is why case mismatch conditions violate this constraint.

The nominative match does not violate any of the constraints. Thus, it is the intrinsic winner irrelevant of the ranking. Recall that the nominative match (mat-nomnom) was read significantly faster than the other conditions at Position 6. This is precisely captured by Tableau 5.5. The dative match (mat-datdat) and the hierarchy harmonic nominative-dative mismatch (har-nomdat) failed to reach a significant reading time difference. This result can also be captured by Tableau 5.5 as both conditions violate No-PATIENT-RelPron. The hierarchy harmonic nominative-dative mismatch (har-nomdat) and the hierarchy opposing dative-nominative mismatch (opp-datnom) violate SPECIFICITY. Since this constraint is locally

tied, No-PATIENT-RelPron might not be decisive for the hierarchy harmonic nominative-dative mismatch.

The longer reading times of the hierarchy opposing dative-nominative mismatch (opp-datnom) compared to the hierarchy harmonic nominative-dative mismatch (har-nomdat) can be explained by SUBSET. The hierarchy opposing dative-nominative mismatch (opp-datnom) violates this constraint because the set of the case features of its covert head is no subset of the set of case features of its relative pronouns. In contrast, this is the case for the hierarchy harmonic nominative-dative mismatch (har-nomdat), making this condition obey SUBSET.

For the time being, it is not clear why a statistically significant reading time advantage could not be found for the dative match (mat-datdat) compared to the hierarchy opposing dative-nominative mismatch (har-datnom). Note, however, that a numeric reading time difference is given.

6 General discussion

A recurring topic of this thesis is that research on free relative clauses has often neglected relevant research findings on headed relative clauses when aiming to account for empirical data on free relative clauses.

As could be shown, especially in Chapter 4.1 (Comparison of preferences in free and headed relative clauses), the commonalities between those constructions are beneficial in embedding the preferences identified for case in German free relative clauses in a much larger research background. Therefore, cases in free relative clauses are no longer a detached area of research but integrated in established current research. The explanatory adequacy of such an approach is higher than of an approach not adhering to independent phenomena.

This thesis specifically examined two preferences operative in headed relative clauses: the preference for parallel syntactic function between overt head and relative pronouns and the preference for subject relative pronouns. These preferences are operative in very similar manners in free relative clauses. Only some adjustments concerning recent inflection theories and the online method measuring incremental processing are needed to make them fit for German free relative clauses. The similarity in the preferences operative in headed and free relative clauses supports the approach of replacing the construction-specific preferences (or rules) in previous research concerning German free relative clauses with universal, construction-independent preferences. The preferences postulated for free relative clauses and their similarity to preferences identified to be operative in headed relative clauses will be addressed once more in this discussion (see Chapter 6.2 Summary of the postulated preferences). All preferences for German free relative clauses, as postulated in this thesis, were corroborated by the results of the study in Chapter 5. To gain a general overview of the results of the three experiments of this thesis let us first recapitulate them.

6.1. Summary of the Results of the experimental studies

Table 6.1 presents an overview of the main findings of all three experiments.[73] Experiment 1 (EXP 1) investigated the cases accusative and dative. The dative match (mat-datdat) was read faster than the other conditions (mat-accacc, har-accdat, opp-datacc) in the first spill-over region of the relative pronoun (Position 2: mat-datdat <[74] mat-accacc, har-accdat, opp-datacc). At Position 3 (the second spill-over region of the relative pronoun), the dative match (mat-datdat) was only read faster than the hierarchy opposing accusative-dative mismatch (opp-accdat; Position 3: mat-datdat < opp-datacc). The other conditions did not differ significantly from each other (mat-datdat = mat-accacc = har-accdat; mat-accacc = har-accdat = opp-datacc). Neither at the position of the critical verb of the free relative clause (Position 5) nor at its spill-over region (Position 6) a reading time difference was found. So, all four conditions were similar in terms of reading time (mat-datdat = mat-accacc = har-accdat = opp-datacc).

Experiment 2 (EXP2) investigated the nominative and accusative cases. The nominative match (mat-nomnom) and the hierarchy opposing accusative-nominative mismatch (opp-accnom) were read faster than the accusative match (mat-accacc) and the hierarchy harmonic nominative-accusative mismatch in the first spill-over region of the relative pronoun (Position 2: mat-nomnom, opp-accnom < mat-accacc, har-nomacc). At the second spill-over region of the relative pronoun, only the nominative match (mat-nomnom) was read faster than the accusative match (mat-accacc) and the hierarchy harmonic nominative-accusative mismatch (har-nomacc; Position 3: mat-nomnom < mat-accacc, har-nomacc).

The hierarchy opposing accusative-nominative mismatch (opp-accnom) continued to not reach areading time difference compared to the nominative match (mat-nomnom) but failed to continue to differ from the accusative match (mat-accacc) and the hierarchy harmonic nominative-accusative mismatch (har-nomacc; mat-nomnom = opp-accnom; mat-accacc = har-nomacc = opp-accnom). No reading time difference was found on the critical verb (Position 5) or in its spill-over region (Position 6; mat-nomnom = mat-accacc = har-nomacc = opp-accnom).

[73] Only significant reading time differences are mention in table 6.1.
[74] The double arrow, '<' , is to be read as 'was read faster than.'

Table 6.1: Summary of the results of the three experiments

	EXP 1 (acc, dat)	**EXP 2 (nom, acc)**	**EXP 3 (nom, dat)**
Position 1 (relative pronoun)	no effect	no effect	no effect
Position 2 (first spill-over region)	mat-datdat < mat-accacc, har-accdat, opp-datacc	mat-nomnom, opp-accnom <mat-accacc, har-nomacc	mat-nomnom, mat-datdat, har-nomdat < opp-datnom
Position 3 (second spill-over region)	mat-datdat < opp-datacc	mat-nomnom < mat-accacc, har-nomacc opp-accnom < har-nomacc	mat-nomnom, mat-datdat, har-nomdat < opp-dat
Position 4 (third spill-over region)	no effect	no effect	no effect
Position 5 (critical verb)	no effect	no effect	no effect
Position 6 (first spill-over region)	no effect	no effect	mat-nomnom < mat-datdat har-nomdat < opp-datnom

Experiment 3 (EXP 3) investigated the nominative and dative cases. The hierarchy opposing dative-nominative mismatch (opp-datnom) was read slower than the other conditions in the first and second spill-over region of the relative pronoun (Positions 2 and 3: mat-nomnom, mat-datdat, har-nomdat < opp-datnom). While the dative match (mat-datdat) and the hierarchy harmonic nominative-dative mismatch (har-nomdat) did not differ from each other on the spill-over region of the critical verb of the free relative clause (Position 6), both conditions revealed faster reading times than the hierarchy opposing dative-nominative mismatch (opp-datnom; mat-datdat, har-nomdat < opp-datnom). Further, the nominative match (mat-nomnom) was read faster than the dative match (mat-datdat) and the hierarchy opposing dative-nominative mismatch (opp-datnom) and the dative match faster than the hierarchy opposing dative-nominative mismatch (mat-nomnom < mat-datdat < opp-datnom). Neither the nominative match (mat-nomnom) nor the dative match (mat-datdat) differed in reading times from the hierarchy harmonic nominative-dative mismatch (har-nomdat; mat-nomnom = har-nomdat; mat-datdat = har-nomdat). Importantly, no postulated preference can account for these results in isolation. Only an interaction of them can account for the data of the experiments.

6.2. Summary of the postulated preferences

In Chapter 2.2. (Morphosyntactic approach to case in free relative clauses) and Chapter 3.3. (Deconstructing the subject notion), three construction-independent, universal, violable preferences were postulated for German free relative clauses. They are assumed to be able to account for the results of the experiments in this thesis.

In Chapter 2 and 3 of this thesis, it was highlighted how the universal preferences have been shown to be operative in very similar manners in constructions with headed relative clauses. They share many commonalities with free relative clauses and their preferences are applicable to numerous constructions not related to free or headed relative clauses (see Chapter 1).

The Subset Preference identified for free relative clauses is meant to replace the construction-dependent Case Hierarchy Preference used previous research to describe empirical data. The Case Hierarchy Preference is based on the case hierarchy and prefers constructions with a relative pronoun with a case that is more marked (lower on the case

hierarchy/ more toward the right) than the case of the covert head. Although there is no specific equivalent preference concerning headed relative clauses, there is evidence that the case hierarchy is operative in headed relative clauses as well. As mentioned in Chapter 2.1.2. (Case Hierarchy Rule in free relative clauses), Schlesewsky (1997) finds the case hierarchy to be operative in headed relative clauses in his self-paced reading study.

As mentioned above, the Subset Preference was introduced to explain Pittner's construction-dependent Case Hierarchy Rule (see Chapter 2.1.2. Case Hierarchy Rule in free relative clauses), as discussed in Chapter 2.2. (Morphosyntactic approach to case in free relative clauses). This preference is derived from theoretical research (subset principle) and corroborated by empirical research (concerning free relative clauses, see Bausewein 1991, Mewe 2014; Pittner 2003; Vogel & Frisch 2003; Vogel & Zugck 2003; Vogel, Frisch & Zugck 2006; Vogel 2011; see also for relative clauses, Schlesewsky 1997; for research concerning features other than case features, see Opitz et al. 2013, Opitz & Pechmann 2014, Penke et al. 2004, among others). Within this framework inflection forms are decomposed into features. Feature decomposition of case is also adopted for the purpose of the current thesis. Specifically, the cases of the covert head and the relative pronoun were considered to distinguish between different kinds of case mismatch constructions. According to the Subset Preference, case mismatches, where the set of case features of the covert head is a subset of the set of case features of the relative pronoun, are preferred over case mismatches where this is vice versa. In hierarchy harmonic mismatches, the set of case features of the covert head is a subset of the set of case features of the case the relative pronoun. In hierarchy opposing mismatches, the set of case features of the case of the covert head is not a subset of the set of case features of the case the relative pronoun. Thus, the first is preferred. This construction-independent, universal preference not only accounts for empirical data of previous and current research but also explains why the construction-dependent Case Hierarchy Preference could be adduced to describe the acceptability decline from hierarchy harmonic to hierarchy opposing mismatches in empirical data. According to the approach centering around the Case Hierarchy Preference (cf. Case Hierarchy Rule in Pittner 1991) the case hierarchy is a hierarchy of morphological markedness. Lower cases on the case hierarchy (cases to the right) code a higher level of markedness. Higher markedness is derived from a higher number of features. Consequently, the case hierarchy can be derived from the feature specifications of the cases. In other words, the Case Hierarchy

Preference is a logical entailment of the feature specifications of cases. Thus, when the Subset Preference applies for German free relative clauses, this entails that the Case Hierarchy Preference must apply as well. It is merely an epiphenomenon describing empirical data. The explanation for empirical findings concerning case mismatches in German free relative clauses is provided by decomposing cases into features and the Subset Preference (based on the subset principle).

The Specificity Preference is the second preference identified for free relative clauses; it is similar to the preference for parallel syntactic functions of the head of the relative clause and the relative pronoun established for headed relative clauses in previous research. The Parallel Syntactic Function Preference has been observed in typological research on headed relative clauses. This preference states that the syntactic function of a covert head and relative pronoun preferably match: A construction with a subject head and a subject relative pronoun and a construction with an object head and an object relative pronoun are preferred over any other combination. In Chapter 3.1. (Parallel syntactic function in headed relative clauses), this preference was shown to also apply to free relative clauses (for (free) relative clauses, see Fanselow et al. 1999, Ishizuka 2005, Levy et al. 2013, Schlesewsky 1997, Bausewein 1991, Mewe 2014; Pittner 2003; Vogel & Frisch 2003; Vogel & Zugck 2003; Vogel, Frisch & Zugck 2006; Vogel 2011, Groos & van Riemsdijk 1981, van Riemsdijk 2006; for similar effects on other clause boundaries see also Streb et. al 1999; for an application of this as specificity, see Opitz et al. 2013 and Opitz & Pechmann 2014).

This preference needed to be adjusted because studies suggest that objective cases cannot always be summarized as a homogeneous group. This is also true for the German case system. Thus, the Parallel Syntactic Function Preference should rather be regarded as a special case-based manifestation of the Case Match Preference for headed relative clauses, much like the one discussed for free relative clauses (Bausewein 1991, Mewe 2014; Pittner 2003; Vogel & Frisch 2003; Vogel & Zugck 2003; Vogel, Frisch & Zugck 2006; Vogel 2011). The preference for case match was explained by decomposing the cases of the covert head and the relative pronoun of free relative clause constructions into features as established in modern inflection theories. The principle that explains why case matches are preferred over case mismatches is the specificity principle.

The Specificity Preference based on the specificity principle is meant to explain the advantage of case match over case mismatch, including an advantage over mismatches

obeying the Case Hierarchy Preference (hierarchy harmonic mismatches). Similar to the Subset Preference, the Specificity Preference is based on theoretical research (specificity principle) concerning the feature decomposition of inflection forms and is corroborated by empirical research (concerning free relative clauses, see Bausewein 1991, Mewe 2014; Pittner 2003; Vogel & Frisch 2003; Vogel & Zugck 2003; Vogel, Frisch & Zugck 2006; Vogel 2011; see also for relative clauses Schlesewsky 1997; for independent research concerning features other than case features see Opitz et al. 2013, Opitz & Pechmann 2014, Penke et al. 2004, amongst others; for research on other clause boundaries see also Streb et. al 1999). The specificity principle states that out of all compatible morphological instantiations, the one with the highest specificity—i.e. the one with the set of most required case features for the current context—is chosen. Applied to (free) relative clauses, this means that a case match is preferred over any case mismatch because the former provides the highest specificity in terms of the case features of (c)overt head in relation to the relative pronoun.

Combining the Subset Preference and the Specificity Preference provides a congenial explanation to previous empirical research concerning German free relative clauses. An acceptability cline was found continuously from case match as the most acceptable construction over hierarchy harmonic mismatches to hierarchy opposing mismatches as the least acceptable construction (see Mewe 2014, Vogel 2011). The explanation for this acceptability cline is simple. A case match obeys the Subset Preference and the Specificity Preference. A hierarchy harmonic mismatch obeys the Subset Preference but violates the Specificity Preference. A hierarchy opposing mismatch violates the Subset Preference and the Specificity Preference. Thus, the acceptability cline directly reflects the construction's violation or obedience to the postulated preferences centering around case features.

Instead of relying on two unrelated construction-specific approaches (Hierarchy Rule Preference and Case Match Preference) to describe empirical data, the Subset Preference and the Specificity Preference are universal and construction-independent, derived from principles related to the feature decomposition of recent inflection theories, and they provide a congenial theoretical explanation for the acceptability decrement found in empirical studies concerning German free relative clauses.

The Proto-Agent First Preference is meant to replace the construction-dependent Subject Preference for relative pronouns. Chapter 3.2. (Subject Preference for relative pronouns in headed relative clauses) discussed a Subject Preference for headed relative

clauses put forward by Keenan & Comrie (1977) based on their Accessibility Hierarchy (AH). According to the AH, subject relative pronouns are preferred over object relative pronouns. This preference was also shown to apply to German free relative clauses. However, the terms *subject* and *object* are equivocal. Following Keenan (1976) and Primus (2015), the notions of subject and object can be defined, inter alia, in terms of case (subjects are associated with the nominative case and objects predominantly with the accusative, dative), structural position (subjects precede objects), or thematic role (subjects are tied to a generalized agent notion and objects to a generalized patient notion, cf. e.g. Dowty 1991). There is a cross-linguistically recurrent pattern where verbal arguments having structural subject properties do not bear the nominative case but the dative case. This pattern is also attested in German. Such dative arguments are found to precede nominative co-arguments in basic word order and therefore can occur sentence initially. It was argued that dative arguments may occur sentence initially because they may code agentive roles in German (cf. Primus 1999, 2015, Bornkessel 2002; Bornkessel et al. 2002, Bornkessel et al. 2003). In contrast, the accusative is restricted to patient roles in German and therefore does not occur sentence initially in basic word order. As mentioned above, an association of nominative arguments with subject and agentive roles is unequivocal. Hence, dative and nominative arguments may occur sentence initially in basic word order while accusative arguments cannot. This is corroborated by Bornkessel et al.'s (2002, 2003) neurophysiological data on processing preverbal arguments in German.[75] These studies reveal a preference for datives and nominatives in initial positions vis-a-vis accusatives in online—i.e. incremental – sentence processing irrespective of whether the critical verb assigned a patient-like dative proto-patient (DatPat) or proto-agent dative (DatExp). It is not only nominative-marked arguments that are strongly associated with the structural position of subjects that can occur sentence initially in basic word order. Dative-marked arguments that are usually associated with the structural position of objects may code agentive roles and therefore occur sentence initially in basic word order. Thus, these studies provide evidence that it is necessary to deconstruct the notion of *subject* and object to approach the topic of the current thesis accurately.

Bornkessel et al. (2002, 2003) have additionally corroborated a crucial assumption upheld in the literature on human language processing: The parser processes incoming

[75] See also Schumacher et al. (2016, 2017) for the influence of thematic roles in pronoun resolution.

material, including thematic roles, immediately and does not wait for disambiguating cues (i.e. the critical verb) to enter the discourse (cf. also Crocker 1994). These findings are crucial for the current thesis as they can be transferred to the processing of German free relative clauses because they examine the incremental processing of an unambiguously case-marked argument of the critical verb with special focus on the case of the initial argument in the subordinate clause.

Transferring the findings to German free relative clauses the parser assumes a basic word order when encountering a nominative or dative relative pronoun. When encountering an accusative relative pronoun a basic word order concerning thematic roles interpretation is not available. This impedes processing and elicits longer reading times. Due to the incremental nature of the chosen method this preference favors different conditions with dative relative pronouns in different sentence positions (before and after encountering the critical verb) of the free relative clause. Since the test material of the current study only included verbs not selecting proto-agent datives, the proto-agent interpretation of dative relative pronouns can only be held until the critical verb is encountered. Then, it becomes apparent that the dative relative pronoun is, in fact, patient-like.

Previous studies did not consider this universal Proto-Agent First Preference because they made use of offline methods where this preference is not palpable. The Proto-Agent First Preference is only concerned with incremental processing. In order to accommodate the mechanisms of the online study of the current thesis (i.e. accounting for the incremental nature of the experimental measurements), incorporating the Proto-Agent First Preference and the mechanism of incremental processing were not only inevitable but also crucial.

Previous construction-specific preferences to explain data for German free relative clauses can be replaced by general, construction-independent preferences that have already been shown to be operative in headed relative clauses and unrelated constructions.

6.3. Preferences as constraints in the Optimality Theory framework

6.3.1. Transfer of preferences in constraints

The approach utilizing universal, construction-independent, interacting preferences (Subset Preference, Specificity Preference, Proto-Agent First Preference) can explain empirical data. In contrast, previous construction-specific approaches (Case Hierarchy Preference, Case Match Preference) mostly only described empirical data. Considering that they are universal, violable, and seem to interact with each other it appeared to be fruitful to opt for Optimality Theory (OT; Prince & Smolensky 1993, 2004) as a powerful tool to accommodate the interaction between the three preferences. Previous research (Vogel 2011) concerning German free relative clauses also used OT (see Chapter 2.2.2. Feature decomposition of case). Thus, opting for OT bridges current with previous research. However, previous research (Vogel 2011) focused on contexts where headed relative clauses are chosen over free relative clauses. On contrast, the current approach is solely concerned with preferences within free relative clauses.

Note that while OT was not originally designed to account for empirical data, including data from incremental language processing, it is applicable as a processing model for empirical research concerning incremental processing (Hoeks & Hendriks 2005). In fact, OT was shown to be applicable throughout empirical research with various methods. Fanselow et al. (1999) modelled the results their study using OT. Their study was concerned with German headed relative clauses within the self-paced reading paradigm which was also used in this thesis. Fanselow et al. 1999 showed that incremental interpretation of incoming material can be captured by adopting the OT framework. Lamer & de Hoop (2005) used OT to account for the results of several ERP-studies concerning animacy information. Their main focus lay on Dutch constructions. However, they successfully implement OT as a processing model for incremental processing of object relative structures in English. Stevenson & Smolensky (2005) also argue for OT to be a useful tool to account for results on incremental preferences processing (see also Prince & Smolensky 1997). The modulation of the results of the current online method within the OT framework therefore appeared fruitful and supported by previous research.

The three postulated preferences (Subset Preference, Specificity Preference, Proto-Agent First Preference) fulfill all the basic assumptions necessary within the OT framework to be considered constraints. They are universal and construction-independent (first basic assumption). The preferences are violable (second basic assumption). In fact, they must be violable because they partly object each other, yet all the preferences could be shown to be crucial for processing German free relative clauses in this thesis. The preferences are ranked (third basic assumption). As explained in Chapter 2.2. (Morphosyntactic approach to case in free relative clauses), Chapter 4.3. (Introduction to Optimality Theory), and in the interim discussion of the experiments in Chapter 5, SPECIFICITY must logically be ranked higher than SUBSET because it is the more specific of the two constraints. Any candidate obeying SPECIFICITY obeys SUBSET but not vice versa. The fourth basic assumption (competition) is fulfilled as well since in each of the three experiments four free relative clause constructions with different case combinations (= *candidates*) are evaluated and compete against one another in each of the three experiments. Their well-formedness is a result of this competition rather than an inherent characteristic of the candidates. The preferences are assumed to reflect processing costs for the self-paced reading study of the current thesis. Accordingly, they needed to be transferred to constraints addressing processing costs.

The Subset Preference, based on the subset principle where the cases of the covert head and the relative pronoun are decomposed into features, was transferred into SUBSET. The Specificity Preference, also making use of case features, prefers case match over case mismatch and was transferred to SPECIFICITY. The Proto-Agent First Preference incorporates deconstruction of the notion of *subject* and *object* and integrated mechanisms of incremental processing necessary for the chosen online method of the current thesis. This preference was transferred to No-PATIENT-RelPron.

6.3.2. Relevance of the constraints

The results of the experiments showed that none of the constraints postulated in this thesis can account for the results alone. An interaction of the constraints is inevitable. The importance of the constraints put forward emerges for different positions in the experiments of the current thesis. The constraint SPECIFICITY was derived from theoretical approach by making use of case features and the specificity principle (cf. Müller 2003, Wiese 1999). It is corroborated by research (for theoretical approaches concerning German free

relative clauses, see Groos & van Riemsdijk 1981, van Riemsdijk 2006; for experimental approaches, see Mewe 2014, Pittner 2003, Vogel 2011; for research not concerning free relative clauses, see Penke et al. 2004, Opitz et al. 2013; for evidence from research across other clause boundaries, see Streb et al. 1999). Compared to case mismatch conditions case match conditions (which fulfill the specificity principle and the subset principle) were always judged more acceptable than mismatches in acceptability studies and occurred more frequently in corpus studies. The results of the current study are in line with these findings. Note, however, that there is an assumed interaction between the potentially conflicting constraints No-PATIENT-RelPron and SPECIFICITY which may contribute to the latter constraint not being decisive in contrast to previous research using offline methods. Nonetheless, the constraint SPECIFICITY is reflected in the results of the study of the current thesis, as it especially explains the differences found between case matches and case mismatches.

The constraint SUBSET, like SPECIFICITY, was derived from a theoretical approach by making use of case features and the specificity principle (cf. Müller 2003, Wiese 1999, Kiparsky 1973, Di Sciullo & Williams 1987, Fanselow 1991, Anderson 1992, Lumsden 1992, Noyer 1992, Halle & Marantz 1993, Williams 1994, 1997, Halle 1997, Wunderlich 1997b, 2004, Wiese 1999, and Stump 2001). The relevance of the constraint SUBSET is apparent in previous offline studies where hierarchy opposing mismatches were dispreferred against hierarchy harmonic mismatches (except for the hierarchy opposing accusative-nominative mismatch in Pittner 2003 and Mewe 2014). Its importance in the current online study is especially shown in EXP 3 (nominative, dative). Before encountering the critical verb, all conditions obey No-PATIENT-RelPron, which seems to be tied to SPECIFICITY. Due to this, it is only the constraint SUBSET that distinguishes the hierarchy opposing dative-nominative mismatch (opp-datnom) from the other three conditions in sentence regions after the relative pronoun and before the critical verb concerning reading times. Recall, No-PATIENT-RelPron and SPECIFITIY are assumed to be tied. Thus, the output of these tied constraints are the outputs of all possible rankings of the tied constraints. Since all conditions obeyed at least one of the constraints, no condition could be eliminated at this point. Only the violation of the lower ranked constraint SUBSET by the hierarchy opposing dative-nominative mismatch (opp-datnom) causes this candidate to be eliminated. By contrast, none of the other candidates violate SUBSET. This accurately captures the results found for

EXP 3. The hierarchy opposing dative-nominative mismatch (opp-datnom) was read significantly slower in sentence regions after the relative pronoun and before the critical verb than the other three conditions. Without SUBSET this result could not have been captured.

In EXP 3 at the position of the auxiliary (spill-over region of the critical verb), the relevance of SUBSET is also indisputable. Longer reading times of the hierarchy opposing dative-nominative mismatch (opp-datnom) compared to the hierarchy harmonic nominative-dative mismatch (har-nomdat) on the auxiliary can only be explained by SUBSET. The hierarchy opposing dative-nominative mismatch (opp-datnom) violates this constrain, while the hierarchy harmonic nominative-dative mismatch (har-nomdat) obeys this constraint.

The relevance of the constraint No-PATIENT-RelPron is shown in all three experiments on different sentence positions. EXP1 (accusative, dative) and EXP2 (nominative, accusative) have accusative relative pronouns that unequivocally code a proto-patient. No-PATIENT-RelPron is the only constraint that can capture the differences caused by the assumed thematic roles coded by the case of the relative pronoun. In EXP 1 (accusative, dative), the dative match (mat-datdat) was read faster than all other conditions on the article (first spill-over region of the relative pronoun). Crucially, for the relevance of No-PATIENT-RelPron, the dative match (mat-datdat) was read faster than the accusative match (mat-accacc). The constraint SPECIFICITY can explain why a match condition is read faster than a mismatch condition. However, it cannot account for the differences within match conditions. Since SUBSET is not concerned with match conditions, this constraint must also be excluded as an explanation for the result. Only No-PATIENT-RelPron explains why the dative match (mat-datdat) was read faster than the accusative match (mat-accacc) appropriately. The dative relative pronoun in the dative match (mat-datdat) is interpreted as a proto-agent. Thus, it is preferred over the accusative relative pronoun in the accusative match (mat-accacc) which can only be interpreted as a proto-patient. Since patient relative pronouns are to be avoided in initial positions according to this constraint, the dative match (mat-datdat) has a reading time advantage over the accusative match (mat-accacc) at Position 2.

In EXP 2 (nominative, accusative), match conditions differed from each other once more. The nominative match (mat-nomnom) was read faster than the accusative match

(mat-accacc). Again, SPECIFICITY and SUBSET cannot account for this result for the same reasons as explained above concerning EXP 1. Only No-PATIENT-RelPron can explain this result: the nominative relative pronoun in the nominative match (mat-nomnom) codes a proto-agent that can occur sentence initially in basic word order. An accusative relative pronoun which codes a proto-patient cannot occur sentence initially in basic word order. While the nominative match obeys NO-PATIENT-RelPron the accusative match violates this constraint. Only No-PATIENT-RelPron can account for the reading time difference between the case matches in EXP 2.

Another result of EXP 2 that appears unexpected from previous research on free relative clauses can only be explained appropriately by No-PATIENT-RelPron: The hierarchy opposing accusative-nominative mismatch (opp-accnom) was not only read faster than the hierarchy harmonic nominative-accusative mismatch (har-nomacc) but was also read faster than the accusative match (mat-accacc). Only NO-PATIENT-RelPron and its entailed avoidance of initial proto-patients (which holds for mat-accacc and har-accnom) account for this result.

In EXP 3 (nominative, dative), the relevance of No-PATIENT-RelPron becomes apparent at the auxiliary (spill-over region of the critical verb). Before, match conditions did not differ from each other concerning reading times. At the auxiliary, they revealed a reading time difference. The nominative match (mat-nomnom) was read faster than the dative match (mat-datdat). This is because the parser interpreted the nominative relative pronoun as a proto-agent. Before encountering the critical verb the parser also interprets the dative relative pronoun as a proto-agent. While the parser can hold the proto-agent assumption for the nominative relative pronoun after encountering the critical verb reinterpretation of the dative relative pronoun as a patient-like dative becomes necessary when encountering the critical verb. The assumed agentive role of the dative relative pronoun was incorrect. Thus, at the critical verb it becomes apparent that the conditions with dative relative pronouns, in fact, violate No-PATIENT-RelPron. Before the critical verb they are assumed to obey this constraint. Hence, the reading time difference between the nominative match (mat-nomnom) and the dative-match (mat-datdat) first occurring at the auxiliary (the spill-over region of the critical verb) can only be accounted for by No-PATIENT-RelPron.

Especially this last result shows two crucial aspects. First, the Subject Preference assumed for headed relative clauses in previous research (Keenan & Comrie 1997, see also Kirby 1998, Sheldon 1974 and MacWhinney & Pléh 1988) is inappropriate for German as it is mainly targeted toward the grammatical function. A distinction between subject and object could not account for the differences found between the accusative match and the dative match. However, accusatives and datives differ in German since datives may code a proto-agent while accusatives cannot. Proto-agents—nominatives and datives alike—are preferred in initial positions. Thus, instead of assuming a Subject Preference, it is more expedient to assume a Proto-Agent First Preference (reflected in No-PATIENT-RelPron) to explain the results of the experiments.

Second, No-PATIENT-RelPron could not evoke an acceptability advantage for dative relative pronouns in previous offline studies (Bausewein, 1991; Mewe, 2014; Vogel & Frisch, 2003; Vogel & Zugck, 2003; Vogel 2011) because this constraint is limited to incremental processing. In contrast, in previous offline studies test sentences were given in their entirety before providing an acceptability judgement. That is, incremental processing could not be measured. Thus, No-PATIENT-RelPron is not applicable to the results of these studies.

6.3.3. Ranking of the constraints

Let us now turn to the ranking of the constraints. The theoretical background of SUBSET and SPECIFICITY is similar. Both are concerned with the case features of the covert head and the relative pronoun; they are derived from the Subset Preference (based on the subset principle) and the Specificity Preference (based on the specificity principle). SPECIFICITY must logically be ranked over SUBSET due to the Paninian Principle[76]. Consequently, any candidate obeying SPECIFICITY obeys SUBSET but not vice versa. A case match obeys SPECIFICITY and SUBSET. A hierarchy harmonic mismatch obeys SUBSET but violates SPECIFICITY. A hierarchy opposing mismatch violates SUBSET and SPECIFICITY. The theoretical approach makes the ranking SPECIFICITY << SUBSET inevitable as any condition obeying SPECIFICITY obeys SUBSET because the set of case features of the covert head is a(n improper) subset of the set of the case features of the relative pronoun. This is much in line with the Paninian Principle. Previous research (Vogel 2011, Mewe 2014) corroborated this

[76] "If one rule's [here rather, constraint's, J.M.] structural description is contained in the other's, the rule with the more specific structural description applies first" (Noyer: 1992: 104).

theoretically motivated ranking SPECIFICITY << SUBSET empirically. It is also in line with the results of the current thesis.

The ranking of the hitherto neglected constraint No-PATIENT-RelPron could only be assumed before conducting the experiments. It was argued that for No-PATIENT-RelPron only a local cue (i.e. the case of the relative pronoun) is necessary to examine whether a candidate obeys or violates this constraint. In contrast, for the other two constraints (SPECIFICITY and SUBSET), a comparison between the sets of features of the case of the covert head and the case of the relative pronoun, which are global cues, is necessary. The results of the experiments suggest that No-RelPron is ranked higher than SUBSET and that it is tied to SPECIFICITY.

An interesting issue can be raised concerning different constraint rankings. Vogel (2011, see also Vogel 2002, Vogel & Frisch 2003, Vogel & Zugck 2003) assumes three different 'variants' of German concerning the acceptability of different case match and case mismatch condition in free relative clauses. He derives these variants from empirical data of offline methods (speeded acceptability judgements). However, he stresses that "[n]o dialectal or sociolectal factor could be identified for the three 'variants' German A, B, and C" (Vogel 2011: 344) can be identified. For the time being, these 'variants' are only stipulated. Their existence is a desiderum in research. Still, a first attempt of a modelation of these 'variants' within the OT framework with the constraints provided in this thesis is possible. This thesis focussed on the 'variant' that is discussed with overwhelming predominance in relevant research: German B. According to Vogel, German B is characterized by an acceptability decrement from case match to hierarchy harmonic mismatch to hierarchy opposing mismatch. Thus, the SPECIFICITY and the SUBSET hold. The ranking SPECIFICITY << SUBSET can be assumed and is also corroborated by the results of this online study. German C is characterized by prohibiting any case mismatch. Thus, this 'variant' yields for a constraint ranking where SPECIFICITY is ranked above any other constraint and is not tied to any constraint. By doing this, any candidate that is not a case match is excluded from further evaluation immediately, ensuring no optimal candidates with a case mismatch.[77] Again, as mentioned above, the investigation whether these 'variants'

[77] The issue is more complex for German A. German A is characterized by being ignorant towards case mismatch iff only structural cases (according to Vogel 2011: nominative and accusative) are involved. There is a major issue that needs to solved before attempting a modulation of this 'variant' within the OT framework: Why is this 'variant' ignorant to structural cases? After answering this question, further investigation of this 'variant' and an OT analysis is possible.

concerning acceptability of German free relative clauses exist and if so how these variants may be modulated within the OT framework may be a topic of further research.

6.4. Residual data

The preferences postulated in this thesis and their transfer to constraints to fit the OT framework can explain most of the data. However, some results still cannot be captured.

First, in EXP 2 (nominative, accusative) at the first and second spill-over region of the relative pronoun, the hierarchy opposing accusative-nominative mismatch (opp-accnom; accusative covert head and nominative relative pronoun) failed to reach a significant reading time difference compared to the nominative match (mat-nomnom). This cannot be captured by an OT analysis which yields the nominative match (mat-nomnom) as the only winner.

Second, in EXP 1 (accusative, dative) at the second spill-over region of the relative pronoun, the hierarchy opposing dative-accusative mismatch (opp-datacc; dative covert head and accusative relative pronoun) was the only condition to reveal a significant reading time difference compared to the dative match (mat-datdat) at the second spill-over region of the relative pronoun. OT analysis yields the dative match (mat-datdat) as the intrinsic winner of the evaluation.

Hence, differences in constraint violation tend to fall short to be represented in significant reading times differences. This circumstance is expected due to three reasons. First, while self-paced reading is a time-sensitive method reflecting incremental processing as opposed to offline methods of previous research concerning German free relative clauses, it might not be time-sensitive enough to show significant reading time differences for all comparisons between conditions. More time-sensitive methods like eye-tracking or ERP-studies might be able to distinguish between conditions much more accurately than the chosen method.

Second, in self-paced reading, participants are in control of the button press that provides the reaction time measurements. This is a less direct mapping of the time needed to process a word than in eye-tracking or ERP. Therefore, the collected data is more susceptible to the effects of speed-accuracy trade-off (Bornkessel & Bornkessel-Schlesewsky 2009: 34). However, it is crucial to acknowledge that while not all different OT profiles of the

conditions are reflected as significant reading time differences between conditions the numeric trends are always in line with the predictions put forward by the OT profiles of the conditions. Further, there is no instance of a significant reading time difference that opposes the predictions of the OT profiles of the candidates.

Third, only three constraints have been identified to influence German free relative clause processing and two of them (No-PATIENT-RelPron and SPECIFICITY) seem to be tied. This explanation becomes more persuasive when considering conditions (= candidates) with OT profiles that differ with respect to at least two constraints. When conditions differ from each other with respect to at least two constraints a significant reading time difference always occurs in this study when there is irrelevant ranking of the constraints. This applies to five comparisons in the three experiments. In EXP 1 at the first spill-over region of the relative pronoun, this applies to the comparison between the dative match (mat-datdat) and the hierarchy opposing dative-accusative mismatch (opp-datacc). In EXP 2 at the first and second spill-over region of the relative pronoun, it applies to the comparison between the nominative match (mat-nomnom) and the accusative match (mat-accacc) as well as between the nominative match (mat-nomnom) and the hierarchy harmonic nominative-accusative mismatch (har-nomacc).

This aspect of marginal OT profile differences of the conditions, combined with a method that might not be time-sensitive enough to capture all differences between conditions in enough detail may cause reading time differences from becoming significant.

Another factor preventing reading time differences to reach significance might be the construction's high relative markedness concerning its structural complexity (cf. Vogel & Frisch 2003, Vogel & Zugck 2003, Vogel, Frisch & Zugck 2006, Vogel 2011). Free relative clauses are a rare phenomenon. The effect of this relative markedness may contribute to a lack of significant reading time differences caused by the experimental manipulation between conditions where they were predicted and occurred only numerically.

6.5. Methodological aspects

6.5.1. Frequency

Another aspect that needs to be addressed is the frequency of initial accusative and dative arguments. Frequency has often been addressed, especially in language processing, as a crucial factor. It could be argued that the processing advantage found for initial dative relative pronouns in this thesis cannot be attributed to the Proto-Agent First Preference. Rather, initial dative arguments might occur more often than accusative arguments. Consequently, an initial dative argument is expected while an initial accusative argument is not. This should result in faster reading times for the initial dative vs. accusative in the current experimental studies. If this is true it could be an explanation for some of the results of the experiments of the current thesis. Vogel & Zugck (2003) confirm with their corpus study that initial datives are more frequent than initial accusatives in free relative clauses in German. They used the COSMAS-II corpora of the IDS Mannheim and searched for animate relative pronouns in nominative (*wer* 'who'), accusative (*wen* 'whom'), and dative (*wem* 'whom'). Table (6.2.) shows the distribution of case in relative pronouns in German free relative clauses (Vogel & Zugck 2003: 150; information reduced to relative clauses):

(6.2.) Distribution of case in relative pronouns in German free relative clauses

Pronoun	**Free relative clause**
wer 'who'	339 (68,20%)
wen 'whom'	41 (8,54%)
wem 'whom'	150 (30,80%)

Recall, in EXP1 (accusative, dative) at the first spill-over region of the relative pronoun, the dative match (with a dative relative pronoun; mat-datdat) was read faster than the accusative match (with an accusative relative pronoun, mat-accacc). This might be explained by the relative frequency of dative relative pronouns vis-a-vis accusative relative pronouns. Frequency can also account for the results of EXP 2 (nominative, accusative) where conditions with nominative relative pronouns were read significantly faster than conditions with accusative relative pronouns at the first spill-over region of the relative pronoun.

However, there are major problems with this approach. First, a compelling argument

against the frequency account can be made with respect to the comparison of nominative vs. dative case in EXP 3. Nominative relative pronouns occur more than twice as often as dative relative pronouns. Thus, if frequency is the decisive factor to explain why in EXP 1 at the first spill-over region, the dative relative pronoun was read faster than the accusative relative pronoun, the same should hold for the comparison between nominative and dative relative pronoun in EXP3. However, this was not the case. Recall that a reading time difference between nominative match (mat-nomnom) and dative match (mat-datdat) did not occur until encountering the first spill-over region of the critical verb. Further, the reanalysis effect found on the spill-over region of the critical verb in the same experiment (EXP 3) should not have occurred if frequency is the decisive factor.

Instead, a congenial explanation is offered only by the Proto-Agent First Preference. Let us go through the results mentioned above with the Proto-Agent First Preference as the explanatory approach. According to the Proto-Agent First Preference datives and nominative can occur sentence initially in basic word order. Thus, the results concerning EXP 1 (accusative, dative) and EXP 2 (nominative, accusative) mentioned above can equally be explained by the Proto-Agent First preference as by frequency. However, the change in reading time differences between the nominative match (mat-nomnom) and the dative match (mat-datdat) can only be attributed to the Proto-Agent First Preference. Before encountering the critical verb the human processor assumes the dative relative pronoun to be a proto-agent obeying this preference. Thus, no reading time differences between the dative match and the nominative match occur. Once it becomes apparent that the initial interpretation of the dative relative pronoun was false (when encountering the critical verb), a reading time difference occurred. The argumentation with frequency as an explanation fails to account for the results as it cannot capture how reading time discrepancies can vary depending on the position of the sentence. In contrast, the Proto-Agent First Preference can account for the results accurately.

Thus, frequency appears to be a result of the Proto-Agent First Preference, much like dative relative pronouns eliciting no reading time differences vis-a-vis nominative relative pronoun but being read faster than accusative relative pronouns. The correlation between frequency and the results of this study is simply a correlation. The causation for both is the Proto-Agent First Preference.

6.5.2. Effect, sentence position, and case-bearing sentence material

Another methodological issue needs to be addressed. As explained in Chapter 5.1. (The self-paced reading paradigm) increased reading times reflecting that processing difficulties may not appear directly in the critical region. Instead, self-paced reading effects often occur in spill-over regions (Bornkessel-Schlesewsky & Schlesewsky 2009: 34) that follow the critical region. The nature of the method (i.e. pressing buttons to continue reading) causes the participants to develop a pressing rhythm. Interrupting it to process a critical region may not be immediately possible. Hence, the effects are skewed to later post-critical regions (i.e. spill-over regions).

In the study of the current thesis language material in spill-over regions differed between EXP 1 and both EXP 2 and 3, as explained in EXP 2 (Chapter 5.3.1. Material and design). In EXP 1, the first position with significant reading time differences was the first spill-over region of the relative pronoun which is the case-unambiguous article (*der*) of the following noun phrase. As mentioned in the discussion of EXP 1, at this point the effect could not unequivocally be attributed to the experimental manipulation of the test material concerning cases of the covert head and the relative pronoun. It was speculated that new case information of the noun phrase's article might have influenced the effects found at the spill-over region of the relative pronoun. This is why, for EXP 2 (and 3), the material was slightly altered and a modifier[78] was placed between the relative pronoun and the article[79]. EXP2 revealed that earliest effects continue to occur in the spill-over region immediately following the relative pronoun. Thus, the measured reading time differences at the first spill-over region of the relative pronoun can be ascribed to the experimental manipulation of the test material in all experiments, including EXP 1, and are not contingent on the availability of the case information of the determiner of the noun phrase of the free relative clause.

6.6. Relation between the results of previous offline studies and the results of the current online study

The constraints SPECIFICITY and SUBSET are derived from previous theoretical research by making use of features, the Subset Preference (based on the subset principle), and the

[78] In EXP 1 this modifier is at Position 4; in EXP 2 and 3 this modifier is at Position 2.
[79] In EXP 1 the article is at Position 2; in EXP 2 and 3 the article is at Position 3.

Specificity Preference (based on the specificity principle). This approach was adapted in the current thesis by decomposing the case of the covert head and the relative pronoun into features. The constraints can account for most of the results of previous and current empirical research on free relative clauses. Different from previous approaches that used construction-specific approaches to explain empirical data, the approach pursued in this thesis can explain most of the empirical data of previous studies and of the experimental results from the current thesis. Note, further, that previous construction-specific approaches fail to accurately account for the data for the current thesis.

Crucial to the approach of the current thesis are two construction-independent, universal principles (subset principle and specificity principle)—these are based on theoretical research (Bierwisch 1967, Wiese 1999 Wunderlich 1997) concerning decomposition into features (for this thesis, decomposition of cases into features) and supported by empirical findings (Penke et al. 2004, Opitz et al. 2013, Opitz & Pechmann 2014). The empirical findings show that decomposition does not only provide a theoretical explanation, but it is palpable as reaction time delays (as in Penke et al.'s sentence-matching task) or identifiable components in ERP studies (as in Opitz et al. 2013, Opitz & Pechmann 2014).

The only exception that SPECIFICITY and SUBSET cannot account for is the hierarchy opposing accusative-nominative mismatch that continues to contradict predictions just as in previous research. The advantage of the approach adopted in this thesis is that it explains the empirical data based on a theoretical background with universal, construction-independent preferences rather than describing the empirical data with construction-specific rules. Importantly, the constraint No-PATIENT-RelPron can account for current empirical data but not for previous empirical data. This is because previous studies used offline methods. No-PATIENT-RelPron is a constraint solely concerned with online methods (i.e. incremental processing).

Interestingly, a preference found for headed relative clauses may hint toward an explanation of previous offline data: the Subject Preference (see Chapter 2.2.3. The subset principle and the specificity principle for case). Recall that the hierarchy opposing accusative-nominative mismatch (opp-accnom), which was already discussed in Chapter 2.1.2. (Case Hierarchy Rule in free relative clauses) was continuously found to be an exception from the rule as it did not show significant acceptability judgement differences vis-a-vis the hierarchy

harmonic nominative-accusative mismatch (har-nomacc; Mewe 2014) or was the only hierarchy opposing mismatch found in a corpus study (Pittner 2003; see Vogel 2011 for contradictory results). This hierarchy opposing accusative-nominative mismatch violates the Subset Preference (and therefore, Pittner's Case Hierarchy Rule) but conforms to the Subject Preference for relative pronouns. This might explain the findings in Pittner (2003) and Mewe (2014). Note that this is only an assumption. Further studies specifically concerning the Subject Preference of headed relative clauses in offline data with free relative clauses is needed to confirm this. Crucially, No-PATIENT-RelPron unsurprisingly cannot account for this assumed exception from the rule because it is, as stated above, exclusively concerned with the incremental processing of cases in free relative clauses.

To sum up, the approach pursued in the current thesis is superior to previous approaches in explaining the overall pattern of findings across offline methods and self-paced reading. Although this thesis used a time-sensitive online method, future research with even more precise temporal resolution than the self-paced reading paradigm may be beneficial.

6.7. Outlook for future research

This thesis embedded research concerning German free relative clauses into a larger research context. This was achieved by replacing construction-specific preferences (Case Hierarchy Preference, Case Match Preference) with universal, construction-independent Preferences (Subset Preference, Specificity Preference) and by incorporating a preference formulated for online processing derived from independent research (Proto-Agent First Preference). Hereof, further research topics can be derived. Some of them, I will shortly outline in the following.

First, the sequence in which matrix clause and free relative clause occur could be altered. This thesis investigated German free relative clauses where the matrix clause precedes the free relative clause. Previous research (Bausewein 1991, Mewe 2014, Vogel 2011) examined constructions where the free relative clause precedes the matrix clause. However, exclusively offline methods were used and the results where often not conclusive. Results of Vogel & Zugck's (2003) corpus study suggests that this may be due to their extremely low frequency. Free relative clauses are a very rare and marked phenomenon in

language already. Free relative clause constructions with the embedded clause preceding the matrix clause rarely occur.[80] However, further research could deliver interesting results. Specifically, incremental processing of the relative pronoun preceding the covert head may help to corroborate the Proto-Agent First Preference or possibly specify it.

Second, free relative clauses in other languages could be modeled within the OT framework. This thesis investigated German free relative clauses. However, recall that the three postulated preferences (Subset Preference, Specificity Preference, Proto-Agent First Preference) are universal. This means that they should also be applicable to free relative clauses in other languages. Their interaction can be modeled within the OT framework for other languages. Vogel (2000) motivated an OT approach to account for numerous languages' (im)possible free relative clause constructions. However, he uses OT to show when a free relative clause construction is possible in a language and when a headed relative clause construction must be chosen. Further, his approach aims more towards a typological description than to an explanation of incremental data. The approach of this thesis is concerned with preferences within the group of free relative clauses using an online method. Thus, the three constraints identified in this thesis may be transferred to account for case match and case mismatch constructions in incremental research in other languages. For example, for languages that prohibit any case mismatch (e.g. Dutch or Norwegian, cf. Vogel 2000: 6/7) SPECIFICITY could be ranked above all other constraints. This ensures that any case mismatch candidate is eliminated from the evaluation immediately.[81] Further research concerning free relative clauses in other languages using online methods is necessary and may contribute to an understanding of free relative clause constructions which is more embedded within research than hitherto.

Third, more advanced methods than self-paced reading could be used. Previous research concerning German free relative clauses used offline methods for empirical studies. This study, on contrast, used the online method self-paced reading. In self-paced reading, incremental processing of words or regions is illustrated by providing time measurements mapped to the words or regions read by the participant. The time measurements are

[80] The only exception are subject free relative clauses (with *wer* 'who') that are preferred preceding the matrix clause (Vogel & Zugck 2003: 117)

[81] Note that with the current inventory of constraints languages such as Modern Greek that have case attraction cannot be captured. Other constraints, irrelevant for German free relative clauses (because German does not have case attraction) need to be implemented. In Icelandic, the relative pronoun always bears the case assigned by the matrix verb (Vogel 2000: 7). This makes an OT analysis obsolete.

collected by participants pressing a button to continue reading a sentence. The time participants need to press the button to continue reading the sentence is used as a means of measuring processing difficulty. This illustration of the self-paced reading paradigm shows that data collection is mediate. Participants have to recognize a stimulus, process it, activate their motor activity and eventually press the button. Therefore, it may be influenced by confounding factors that could have prevented some reading time differences in this study to reach significance. Thus, although self-paced reading, as an online method, is time-sensitive and incorporates spatial resolution there are more time-sensitive online methods with spatial resolution where data collection is immediate. This eliminates possible confounding factors. One of these methods is the ERP method.[82]

ERPs are time-locked multidimensional measurements of brain activity when encountering a critical stimulus. Potential changes in the electroencephalogram (EEG) are measured to examine the electrophysiological response of the brain to a stimulus. The brain's activity is measured and no button press is necessary which may be a confounding factor. Previous studies mentioned in this thesis used this method to investigate structures other than free relative clauses. However, the results of these studies might hint toward results expected in German free relative clauses.

Recall from Chapter 2.2.3. (Specificity principle and subset principle for case) that Opitz et al. (2013) investigated adjective inflection in their ERP study. They found a greater LAN (= left anterior negativity) on the nouns of the condition with incorrect adjective inflection violating the subset principle for morphosyntactic contexts with neuter nouns vis-a-vis the nouns in the condition with the incorrect adjective inflection obeying the subset principle. They further found a P600 to differentiate between correct inflection forms (those obeying the subset principle and the specificity principle) and the incorrect inflection forms (obeying or violating the subset principle). These results may hint toward results that can be expected from an ERP study on case in German free relative clauses. Transferring the results of Opitz et al.'s study would predict a greater LAN on the relative pronoun for conditions violating the Subset Preference (and therefore the subset principle and SUBSET; all hierarchy opposing mismatches) vis-a-vis condition obeying the Subset Preference (all hierarchy

[82] For an overview of how ERPs work, see Bornkessel-Schlesewsky & Schlesewsky (2009) and Chapter 2.2.3. (Subset principle and specificity principle for case) and 3.3. (Deconstructing the subject notion) of this thesis.

harmonic mismatches[83]). According to the results of Opitz et al.'s study, conditions violating the Specificity Preference (and therefore the specificity principle and SPECIFICITY; all case mismatches) should elicit a P600 on the relative pronoun vis-a-vis conditions obeying this preference (all case matches).

Bornkessel at el. (2002) found a N400 on initial nominative and dative arguments vis-a-vis accusative arguments in embedded sentences (where the critical verb is at the end of the sentence) in their ERP study. This effect does not occur on initial nominatives vis-a-vis datives. They attribute these results to the fact that nominatives and datives may occur initially in basic work order while accusatives cannot. This is reflected in the Proto-Agent First Preference in this thesis. Again, transferring these results would predict an N400 on the relative pronoun for conditions with nominative or dative relative pronouns (mat-nomnom, mat-datdat, har-accdat, har-nomdat, opp-accnom, opp-datnom) vis-a-vis accusative pronouns (mat-accacc, opp-datacc, har-nomacc).

Further, Bornkessel et al. (2002) found a P600 on the clause-final critical verb. They interpret this P600 as a reanalysis effect on verb selecting a patient-like dative. This effect occurs when the parser encounters the clause-final verb and must alter the initial interpretation of the dative as a proto-agent to a patient-like dative. Such an effect may also occur on the critical verb in an ERP study with German free relative clauses in conditions with dative relative pronouns (mat-datdat, har-accdat, har-nomdat, opp-accnom, opp-datnom). Of course, these are only speculations based on experiments with constructions that are structurally very different than free relative clauses. Further research is inevitable to gather reliable insights for German relative clauses.

Fourth, the preferences could be transferred to constructions other than free relative clauses. Recall that all three postulated constructions are based on theoretical and empirical research independent of free relative clauses. They are universal and construction-independent. Therefore, their influence should also be palpable in other research areas. The most obvious topic of research are headed relative clauses. The three preferences identified for German free relative clauses in this thesis often have similar counterparts established for headed relative clauses. However, transferring the morphosyntactic motivation (applies to Subset Preference and Specificity Preference) and the adaption for incremental processing

[83] All case match conditions obey the Subset Preference. However, case match conditions may be distinguished from all case mismatch conditions by a P600. The LAN might only distinguish between conditions where the set of features of the covert head is a proper (rather than improper) subset of the set of features of the relative pronoun. Importantly, this is only suggested and speculated.

(Proto-Agent First Preference) from free relative clauses to headed relative clauses may contribute to explanatory attempts for both constructions.[84] It can be speculated that they may share the same preferences; only palpable to a different extent.

[84] Within the group of headed relative clauses, appositive and restrictive relative clauses could be a topic of further research.

7 Conclusion

The current thesis fulfills two research desiderata. First, the hitherto construction-specific preferences (or rules) that *described* empirical data were replaced with theoretically based and empirically corroborated universal, construction-independent violable preferences that *explain* empirical data. Second, cases in German free relative clauses were examined by using an online method to map specific words with increased processing costs, as opposed to previous research using exclusively various offline methods.

Previous research focused on two preferences (or rules) to describe empirical data (see Chapter 2.1 State of research; cf. Pittner 1991, Vogel 2011). These are the Case Match Preference and the Case Hierarchy Preference. According to the Case Match Preference, the case of the covert head in the matrix clause and the case of the relative pronoun must be identical (= they must match). The Case Hierarchy Preference distinguishes between two types of case mismatch constructions (i.e. constructions where the case of the covert head and the case of the relative pronoun are not identical). According to this preference, the case of the covert head must be higher on the case hierarchy than the case of the relative pronoun. A construction obeying this preference is labelled as *hierarchy harmonic mismatch* and a construction not obeying this preference is labelled as *hierarchy opposing mismatch* in this thesis. These construction-specific preferences could describe empirical data but they did not explain them as they do not incorporate recent inflection theories. Although previous research addressed morphological instantiation and markedness of cases cases mostly remained abstract. In contrast, this thesis uses the approach of recent inflection theories. Specifically, case deconstruction into features was introduced (cf. Bierwisch 1967, Wiese 1994, see also Wunderlich 1997). The advantage of deconstructing cases into features is that the correct morphological form becomes derivable via universal principles rather than by construction-specific rules. This makes the current approach superior to previous approaches. The cases relevant to this were deconstructed into features with the nominative as cases without features, the accusative with the features [objective], and the

dative with the features [objective] and [oblique]. By decomposing case into features and incorporating the universal and construction-independent subset principle and the specificity principle associated with feature decomposition, the Case Match Preference and the Case Hierarchy Preference could be replaced by the Subset Preference based on the subset principle and the Specificity Preference based on the specificity principle.

The Subset Preference means for German free relative clauses that if the sets of case features of the covert head and the relative pronoun are not identical, the set of features of the case of the covert head is a subset of the set of features of the case of the relative pronoun. Hence, it subsumes the Case Hierarchy Preference. The Specificity Preference means for Germans free relative clauses that among all compatible sets of case features of the covert head within the context, the set with the highest specificity is chosen. Hence, it subsumes the Case Match Preference.

The novum of this approach is that previous construction-specific preferences (or rules) that describe the empirical data of German free relative clauses are replaced with construction-independent principles derived from theoretical research and corroborated by independent experimental research (cf. Penke et al 2004, see also Opitz et al. 2013 and Opitz & Pechmann 2014) that can explain the empirical findings.

The approach of identifying universal preferences operative in free relative clauses was supported by examining the preferences established to be operative in headed relative clauses (Chapter 3). Despite their structural similarities to free relative clauses previous research has mostly neglected to incorporate preferences postulated for this construction to account for the case phenomena found in free relative clauses. Specifically, the preference for the parallel syntactic function between the covert head and the relative pronoun and the preference for the subject relative pronoun were discussed. According to the Parallel Syntactic Function Preference, the (overt) head in the matrix clause and the relative pronoun should be parallel according to their syntactic function. Syntactic function was mostly tied to the case. However, German has two objective cases (accusative and dative) and therefore this preference was regarded as a special case-based manifestation of this typological preference for headed relative clauses. This is very similar to the Case Match Preference discussed for free relative clauses. This supports the conclusion in Chapter 2. The morphosyntactic category, more precisely case concurrence, is a universal, construction-

independent phenomenon where matching in German free relative clauses was explained by the universal Specificity Preference.

The preference for subject relative pronoun in headed relative clauses (based on the Accessibility Hierarchy, cf. Keenan & Comrie 1977) was also discussed in Chapter 3. According to this preference, subjects are easier to extract than objects cross-linguistically. While this was corroborated by numerous empirical studies with different methods and languages this preference, as well as the preference for the parallel syntactic function, inherits the problems connected with the equivocality of the notions *subject* and *object*. Specifically, it was shown how dative arguments may have subject properties due to their agentive thematic role (i.e. experiencer and possessor) based on Dowty's (1991) proto-role approach. Therefore, dative arguments with an agentive role may occur sentence initially in basic word order. This structural position is not limited to nominative arguments in basic word order. This is especially relevant for the incremental nature of the method used in this thesis. Initial dative relative pronouns may be interpreted as proto-agents. Since proto-agents preferentially occur sentence initially dative relative pronouns were not predicted to elicit increased processing costs before encountering the disambiguating verb which always assigned a proto patient role to its dative argument. Thus, the preference for subject relative pronouns identified for headed relative pronouns needed to be replaced with the more comprehensive, general, construction-independent Proto-Agent First Preference. This preference states that proto-agents precede proto-patient co-arguments in basic word order. Importantly, accusative arguments as proto-patients can never occur sentence initially in basic word order as they are proto-patients. This preference is corroborated by research (Bornkessel et al. 2002, 2003) using an online method. Although this research was not concerned with headed free relative clauses it has been argued that the implications of this universal preference will apply to the topic of the current thesis. This turned out to be accurate as will be explicated in more detail later in the conclusion. Addressing the preferences identified for headed relative clauses due to their similarities to free relative clauses supports the approach mentioned above aiming for universal, construction-independent preferences rather than construction-specific preferences (or rules) in order to embed preferences for cases in German free relative clauses in a much larger research background than previous research did.

Chapter 4 provided a summary bringing together all the information necessary for the experimental investigation. First, the preferences of headed and free relative clauses were contrasting to show that very similar preferences are operative in both structurally closely related constructions. Second, the universal preferences postulated for free relative clauses are shown to be, in fact, preferences that are violable. Their violability was illustrated by providing constructions similar to the test material of the study of this thesis were provided in tables to show which preferences prefer which constructions over others. This clearly indicates that the preferences conflict with each other and an interaction between them must be assumed. This interaction can be modeled within the Optimality Theory framework (OT, Prince & Smolensky 1993, 2004) that Chapter 4.3 (Introduction to Optimality Theory) provided an introduction to while also transferring the preferences operative in free relative clauses (Subset Preference, Specificity Preference, Proto-Agent First Preference) to constraints (SUBSET, SPECFICITY, No-PATIENT-RelPron) to fit with the framework. OT proved to be an expedient tool to account for the results of the three-part study of this thesis. The examined cases of these studies are nominative, accusative, and dative. In contrast to previous studies concerning German free relative clauses where data was generated via (speeded) acceptability judgements or corpus counts, the current study used the online method self-paced reading. This method provides the possibility of locating processing difficulties within a sentence as it offers good temporal and spatial resolution. It can reveal a detailed image of when and where processing difficulties occur in German free relative clauses. This was not carried out in previous research.

The experiments' results reveal that all the postulated preferences modeled within the OT framework are expedient. This approach using universal preferences does not only explain most of the data of the current online method but also most of the data of previous offline methods. Previous approaches describe the data gathered from offline methods but fail to describe the data of the current online method. Thus, the current approach is superior to previous approaches.

The ranking of the constraints SPECIFICITY and SUBSET (SPECICIFITY << SUBSET) within the OT can be explained by the former being the more specific structural description and therefore being applied first (*Paninian Principle*, Noyer 1992: 104). In other words, SPECIFICITY outranks SUBSET. Moreover, this ranking is corroborated by previous research and in the current study. No-PATIENT-RelPron has not been considered for German free

relative clauses in previous research. Therefore, it could only be speculated on its ranking. The results of this study suggest that it is tied to SPECIFICITY in cases where ranking is not irrelevant.

Inconclusively accounted data was addressed in the respective interim discussions of the experiments as well as in the general discussion (Chapter 6). Most of them could be explained by the possibly not time-sensitive enough method used in this thesis. An alternative approach to explaining data was provided: an approach focussing on frequency of these cases. It could clearly be argued that the frequency approach is not expedient to account for the relevant data.

This thesis also initializes desiderata in research. As outlines in Chapter 6 (General discussion) one topic of further research is the sequence in which matrix clause and free relative clause occur. An alternation with the free relative clause preceding the matrix clause in an online study could be examined. Further, free relative clauses in other languages could be modeled within the OT framework, given the fact that the constraints are universal and should be applicable in languages other than German. Another desideratum of research lies in opting for more advanced methods than self-paced reading, such as an ERP study.

To summarize, the current thesis has replaced hitherto construction-specific preferences (or rules) which mostly solely describe that empirical data is with theoretically based and empirically corroborated universal, construction-independent violable preferences explaining empirical data. These preferences can also be found in similar ways in headed relative clauses supporting the idea of universal-, rather than construction-specific, preferences. The preferences postulated for free relative clauses are tested for the first time using the online method of self-paced reading. The results could mostly accurately be captured and modeled within the Optimality Theory framework incorporating the preferences as constraints. The approach adopted in the current thesis is superior to previous approaches in explaining the overall pattern of findings across offline methods and self-paced reading. However, while featuring a time-sensitive experimental online method it would benefit from further research using online measures with a more precise temporal resolution than provided by self-paced reading.

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9 Appendix

9.1. Experiment 1 (acc, dat)

9.1.1. Test material

9.1.1.1. har-accdat = hierarchy harmonic accusative-dative mismatch

Der Kunde suchte, wem der Berater zügig geantwortet hatte.
Der Fahrgast beneidete, wem der Zugbegleiter ausführlich geantwortet hatte.
Der Journalist verdächtigte, wem der Anwalt großzügig geholfen hatte.
Der Tourist kannte, wem der Kölner schnell geholfen hatte.
Der Filialleiter beglückwünschte, wem der Kunde herzlich gedankt hatte.
Der Vater umarmte, wem der Sohn mehrfach gedankt hatte.
Der Besucher achtete, wem der Butler diskret gedient hatte.
Der Kamerad rief, wem der Soldat solide gedient hatte.
Der Banker besänftigte, wem der Anleger vorerst misstraut hatte.
Der Sympathisant diffamierte, wem der Guru gänzlich misstraut hatte.
Der Zuschauer bejubelte, wem der Löwe bedingungslos gehorcht hatte.
Der Besitzer bezahlte, wem der Hund uneingeschränkt gehorcht hatte.
Der Sachverständige besuchte, wem der Geschädigte schließlich verziehen hatte.
Der Psychologe erreichte, wem der Betroffene ehrlich verziehen hatte.
Der Schüler unterstützte, wem der Lehrer vehement widersprochen hatte.
Der Reporter benannte, wem der Politiker unverzüglich widersprochen hatte.
Der Mechaniker beschenkte, wem der Gutachter freundlich assistiert hatte.
Der Designer korrigierte, wem der Schneider tatkräftigt assistiert hatte.
Der Manager engagierte, wem der Zuhörer begeistert applaudiert hatte.
Der Gastgeber empfahl, wem der Zuschauer ausgiebig applaudiert hatte.
Der Architekt boykottierte, wem der Bauherr gütig vergeben hatte.
Der Kriminelle verleumdete, wem der Cousin halbherzig vergeben hatte.
Der Biologe belastete, wem der Chemiker gereizt gedroht hatte.
Der Kapitän tröstete, wem der Matrose gedankenlos gedroht hatte.
Der Beamte befragte, wem der Rektor kürzlich gekündigt hatte.
Der Freund umarmte, wem der Arbeitgeber überraschend gekündigt hatte.
Der Veranstalter erreichte, wem der Sportler enorm imponiert hatte.
Der Galerist duzte, wem der Künstler mühelos imponiert hatte.
Der Ausbilder beschuldigte, wem der Teenager mutig getrotzt hatte.
Der Erzieher ermahnte, wem der Schulfreund dickköpfig getrotzt hatte.
Der Chef respektierte, wem der Betriebsrat aufrichtig vertraut hatte.
Der Freund empfahl, wem der Mandant sehr vertraut hatte.
Der Scout buchte, wem der Verkäufer charmant geschmeichelt hatte.

Der Koch verpflegte, wem der Kellner geschickt geschmeichelt hatte.
Der Schauspieler beneidete, wem der Regisseur herzlich gratuliert hatte.
Der Wirt duzte, wem der Bürgermeister anerkennend gratuliert hatte.
Der Prinz begnadigte, wem der Untertan ergeben gehuldigt hatte.
Der Gelehrte ängstigte, wem der Anhänger naiv gehuldigt hatte.
Der Fan ermutigte, wem der Rivale mächtig geschadet hatte.
Der Forscher erheiterte, wem der Gutachter immens geschadet hatte.

9.1.1.2. mat-datdat = dative match

Der Kunde gehorchte, wem der Berater zügig geantwortet hatte.
Der Fahrgast vertraute, wem der Zugbegleiter ausführlich geantwortet hatte.
Der Journalist widersprach, wem der Anwalt großzügig geholfen hatte.
Der Tourist trotzte, wem der Kölner schnell geholfen hatte.
Der Filialleiter gratulierte, wem der Kunde herzlich gedankt hatte.
Der Vater half, wem der Sohn mehrfach gedankt hatte.
Der Besucher gehorchte, wem der Butler diskret gedient hatte.
Der Kamerad imponierte, wem der Soldat solide gedient hatte.
Der Banker drohte, wem der Anleger vorerst misstraut hatte.
Der Sympathisant huldigte, wem der Guru gänzlich misstraut hatte.
Der Zuschauer applaudierte, wem der Löwe bedingungslos gehorcht hatte.
Der Besitzer dankte, wem der Hund uneingeschränkt gehorcht hatte.
Der Sachverständige trotzte, wem der Geschädigte schließlich verziehen hatte.
Der Psychologe widersprach, wem der Betroffene ehrlich verziehen hatte.
Der Schüler assistierte, wem der Lehrer vehement widersprochen hatte.
Der Reporter imponierte, wem der Politiker unverzüglich widersprochen hatte.
Der Mechaniker half, wem der Gutachter freundlich assistiert hatte.
Der Designer kündigte, wem der Schneider tatkräftig assistiert hatte.
Der Manager vertraute, wem der Zuhörer begeistert applaudiert hatte.
Der Gastgeber schmeichelte, wem der Zuschauer ausgiebig applaudiert hatte.
Der Architekt misstraute, wem der Bauherr gütig vergeben hatte.
Der Kriminelle schadete, wem der Cousin halbherzig vergeben hatte.
Der Biologe schadete, wem der Chemiker gereizt gedroht hatte.
Der Kapitän vergab, wem der Matrose gedankenlos gedroht hatte.
Der Beamte verzieh, wem der Rektor kürzlich gekündigt hatte.
Der Freund diente, wem der Arbeitgeber überraschend gekündigt hatte.
Der Veranstalter antwortete, wem der Sportler enorm imponiert hatte.
Der Galerist verzieh, wem der Künstler mühelos imponiert hatte.
Der Ausbilder kündigte, wem der Teenager mutig getrotzt hatte.
Der Erzieher diente, wem der Schulfreund dickköpfig getrotzt hatte.
Der Chef gratulierte, wem der Betriebsrat aufrichtig vertraut hatte.
Der Freund schmeichelte, wem der Mandant sehr vertraut hatte.
Der Scout assistierte, wem der Verkäufer charmant geschmeichelt hatte.
Der Koch dankte, wem der Kellner geschickt geschmeichelt hatte.
Der Schauspieler applaudierte, wem der Regisseur herzlich gratuliert hatte.
Der Wirt antwortete, wem der Bürgermeister anerkennend gratuliert hatte.
Der Prinz vergab, wem der Untertan ergeben gehuldigt hatte.
Der Gelehrte drohte, wem der Anhänger naiv gehuldigt hatte.
Der Fan huldigte, wem der Rivale mächtig geschadet hatte.

Der Forscher misstraute, wem der Gutachter immens geschadet hatte.

9.1.1.3. opp-datacc = hierarchy opposing dative-accusative mismatch

Der Kunde gehorchte, wen der Berater zügig informiert hatte.
Der Fahrgast vertraute, wen der Zugbegleiter ausführlich beraten hatte.
Der Journalist widersprach, wen der Anwalt großzügig unterstützt hatte.
Der Tourist trotzte, wen der Kölner schnell amüsiert hatte.
Der Filialleiter gratulierte, wen der Kunde herzlich begrüßt hatte.
Der Vater half, wen der Sohn mehrfach korrigiert hatte.
Der Besucher gehorchte, wen der Butler diskret bedient hatte.
Der Kamerad imponierte, wen der Soldat solide instruiert hatte.
Der Banker drohte, wen der Anleger vorerst gemieden hatte.
Der Sympathisant huldigte, wen der Guru gänzlich verhöhnt hatte.
Der Zuschauer applaudierte, wen der Löwe bedingungslos respektiert hatte.
Der Besitzer dankte, wen der Hund uneingeschränkt akzeptiert hatte.
Der Sachverständige trotze, wen der Geschädigte schließlich überführt hatte.
Der Psychologe trotzte, wen der Betroffene ehrlich überrascht hatte.
Der Schüler assistierte, wen der Lehrer vehement getadelt hatte.
Der Reporter imponierte, wen der Politiker unverzüglich kritisiert hatte.
Der Mechaniker half, wen der Gutachter freundlich beraten hatte.
Der Designer kündigte, wen der Schneider tatkräftig bestärkt hatte.
Der Manager vertraute, wen der Zuhörer begeistert bejubelt hatte.
Der Gastgeber schmeichelte, wen der Zuschauer ausgiebig gefeiert hatte.
Der Architekt misstraute, wen der Bauherr gütig beschwichtigt hatte.
Der Kriminelle schadete, wen der Cousin halbherzig abgelenkt hatte.
Der Biologe schadete, wen der Chemiker gereizt beschimpft hatte.
Der Kapitän vergab, wen der Matrose gedankenlos aufgeregt hatte.
Der Beamte verzieh, wen der Rektor kürzlich entlassen hatte.
Der Freund diente, wen der Arbeitgeber überraschend verwarnt hatte.
Der Veranstalter antwortete, wen der Sportler enorm beeindruckt hatte.
Der Galerist verzieh, wen der Künstler mühelos fasziniert hatte.
Der Ausbilder kündigte, wen der Teenager mutig abgelenkt hatte.
Der Erzieher diente, wen der Schulfreund dickköpfig geärgert hatte.
Der Chef gratulierte, wen der Betriebsrat aufrichtig gelobt hatte.
Der Freund schmeichelte, wen der Mandant sehr geachtet hatte.
Der Scout assistierte, wen der Verkäufer charmant ermuntert hatte.
Der Koch dankte, wen der Kellner geschickt belustigt hatte.
Der Schauspieler widersprach, wen der Regisseur herzlich beglückwünscht hatte.
Der Wirt antwortete, wem der Bürgermeister anerkennen geehrt hatte.
Der Prinz vergab, wen der Untertan ergeben bewundert hatte.
Der Gelehrte drohte, wen der Anhänger naiv vergöttert hatte.
Der Fan huldigte, wen der Rivale mächtig beeinträchtigt hatte.
Der Forscher misstraute, wen der Gutachter immens benachteiligt hatte.

9.1.1.4. mat-accacc = accusative match

Der Kunde suchte, wen der Berater zügig informiert hatte.
Der Fahrgast beneidete, wen der Zugbegleiter ausführlich beraten hatte.

Der Journalist verdächtigte, wen der Anwalt großzügig unterstützt hatte.
Der Tourist kannte, wen der Kölner schnell amüsiert hatte.
Der Filialleiter beglückwünschte, wen der Kunde herzlich begrüßt hatte.
Der Vater umarmte, wen der Sohn mehrfach korrigiert hatte.
Der Besucher achtete, wen der Butler diskret bedient hatte.
Der Kamerad rief, wen der Soldat solide instruiert hatte.
Der Banker besänftigte, wen der Anleger vorerst gemieden hatte.
Der Sympathisant diffamierte, wen der Guru gänzlich verhöhnt hatte.
Der Zuschauer bejubelte, wen der Löwe bedingungslos respektiert hatte.
Der Besitzer bezahlte, wen der Hund uneingeschränkt akzeptiert hatte.
Der Sachverständige besuchte, wen der Geschädigte schließlich überführt hatte.
Der Psychologe erreichte, wen der Betroffene ehrlich überrascht hatte.
Der Schüler unterstützte, wen der Lehrer vehement getadelt hatte.
Der Reporter benannte, wen der Politiker unverzüglich kritisiert hatte.
Der Mechaniker beschenkte, wen der Gutachter freundlich beraten hatte.
Der Designer korrigierte, wen der Schneider tatkräftig bestärkt hatte.
Der Manager engagierte, wen der Zuhörer begeistert bejubelt hatte.
Der Gastgeber empfahl, wen der Zuschauer ausgiebig gefeiert hatte.
Der Architekt boykottierte, wen der Bauherr gütig beschwichtigt hatte.
Der Kriminelle verleumdete, wen der Cousin halbherzig abgelenkt hatte.
Der Biologe belastete, wen der Chemiker gereizt beschimpft hatte.
Der Kapitän tröstete, wen der Matrose gedankenlos aufgeregt hatte.
Der Beamte befragte, wen der Rektor kürzlich entlassen hatte.
Der Freund umarmte, wen der Arbeitgeber überraschend verwarnt hatte.
Der Veranstalter erreichte, wen der Sportler enorm beeindruckt hatte.
Der Galerist duzte, wen der Künstler mühelos fasziniert hatte.
Der Ausbilder beschuldigte, wen der Teenager mutig abgelenkt hatte.
Der Erzieher ermahnte, wen der Schulfreund dickköpfig geärgert hatte.
Der Chef respektierte, wen der Betriebsrat aufrichtig gelobt hatte.
Der Freund empfahl, wen der Mandant sehr geachtet hatte.
Der Scout buchte, wen der Verkäufer charmant ermuntert hatte.
Der Koch verpflegte, wen der Kellner geschickt belustigt hatte.
Der Schauspieler beneidete, wen der Regisseur herzlich beglückwünscht hatte.
Der Wirt duzte, wen der Bürgermeister anerkennend geehrt hatte.
Der Prinz begnadigte, wen der Untertan ergeben bewundert hatte.
Der Gelehrte ängstigte, wen der Anhänger naiv vergöttert hatte.
Der Fan ermutigte, wen der Rivale mächtig beeinträchtigt hatte.
Der Forscher erheiterte, wen der Gutachter immens benachteiligt hatte.

9.1.2. Fillers

9.1.2.1. Ungrammatical fillers

Der Spieler besiegt den Gegner, obwohl er nicht den Favorit war.
Der Student befragt der Kommilitonen, denn der hat im Seminar genau mitgeschrieben.
Der Landwirt kontaktiert den Tierarzt, da ihn sich sehr um seine Pferde sorgt.
Der Angler fängt den Fisch, nachdem er den ganzen Tag in hüfthohes Wasser stand.
Der Schlosser erwartet der Kunde, obwohl dieser bereits vor zwei Tagen absagte.

Die Ente folgt dem Tierwärter, weil er ihr mit der Hand aufgezogen hat.
Das Kind begegnet der Freund, obwohl dieser eigentlich krank im Bett liegen sollte.
Der Rentner gefällt des Pflegers, denn der nimmt sich immer besonders viel Zeit.
Der Praktikant genügt dem Angestellten, weil er alle er gestellten Aufgaben erfüllt.
Der Gärtner ähnelt dem Zauberer, sodass er häufig auf seinen tollen Tricks angesprochen wird.

9.1.2.2. Grammatical fillers

Die Sekretärin bestellt einen Ordner, denn für die anstehende Betriebsfeier wird Sicherheitspersonal benötigt.
Der Händler erwartete den Läufer, obwohl er nicht mehr an der Spitze des Wettlaufes gelaufen ist.
Der Urlauber mag Hamburger, weil sie einfache, schnelle Snacks sind.
Der Musiker begutachtet den Flügel, um dem verletzten Vogel richtig helfen zu können.
Das Unternehmen errichtete eine Bank, damit die Senioren eine Sitzmöglichkeit haben.
Der Spion übersah die Wanze, als sie unter seinem Kissen hervorgekrochen kam.
Der Großvater bemerkte die Ente, sodass die Falschmeldung berichtigt werden konnte.
Der Florist begegnete dem Strauß, obwohl der Tierwärter das Straußengehege abgeschlossen hatte.
Der Reiter entging dem Schimmel, weil er zuvor Chlorreiniger an die Wand gesprüht hatte.
Der Student entkam dem Kater, weil die nette Dame ihn mit Katzenfutter gelockt hatte.
Der Mann begegnete dem Berliner, den er unverzüglich gekauft und noch in der Bäckerei gegessen hat.
Der IT-Experte folgte der Maus, da diese sich in dem PC-Tower ein Nest gebaut hatte.
Das Mädchen folgte der Mutter, die aus dem Schraubenkasten gefallen war.
Der Abenteurer entkam der Schlange, da neben ihm zügig eine neue Kasse öffnete.
Der Tourist ruft den Reiseleiter, um mit ihm den weiteren Verlauf der Reise zu besprechen.
Der Hotelangestellte begutachtete den Aufzug, da er in letzter Zeit häufiger Probleme gemacht hatte.
Der Sänger begeisterte den Kritiker, obwohl dieser anfangs eine schlechte Meinung von ihm hatte.
Der Fan motiviert den Boxer, um ihm für die letzte Runde die nötige Kraft zu geben.
Der Imker untersucht den Bienenstock, damit selbst kleinste Beschädigungen entdeckt werden.
Der Esel folgt dem Tierparkwärter, denn dieser hat immer viel Einfühlungsvermögen gezeigt.
Der Rentner ähnelt dem Apotheker, sodass sie viele Kollegen für Verwandte halten.
Der Hund entlief dem Sportler, weil er ohne Leine durch den Wald rannte.
Die Maus entkommt der Katze, weil sie schnell genug in ihr Versteck zurückkehrte.
Das Pferd gehört dem Mädchen, obwohl eigentlich Ratten ihre Lieblingstiere sind.
Die Hilfskraft bestellt, weil noch einige Schnellhefter Projekte fehlen.
Der Hobbysportler rennt, obwohl er am Ende des Halbmarathons läuft.
Der Reisende glaubt, dass Kieler ruhige und ehrliche Menschen sind.
Die Studentin fragt, wer das angeschlagene Tier artgerecht unterbringen kann.
Die Firma versuchte, durch die Errichtung einer Bank für Senioren ihr Image aufzubessern.
Der Zoobesucher wartete, obwohl der Tierwärter das Außengehege längst geschlossen hatte.
Der Jockey ermittelt, wen gestern das Pferd abgeworfen hatte.
Der Igel gedieh, nachdem eine Anwohnerin ihn mit Katzenfutter gestärkt hatte.
Der Urlauber sah, dass sich ein weiterer Berliner in dem Resort aufhielt.

Der Jugendliche entdeckte, dass sich eine Maus hinter dem PC ungeschickt versteckt hatte.
Der Wanderer fragte, wen er bis zum Gipfel mitnehmen kann.
Die Angestellte überprüft, wer den Drucker nun endlich repariert hat.
Der Maler begeisterte, sodass der Reporter dem Artikel eine volle Zeitungsseite zuteilte.
Der Trainer versuchte, dem Spieler für die letzte Halbzeit ausreichend Motivation zu geben.
Der Pilger weiß, wem seine Armbanduhr in den Ameisenhaufen gefallen war.
Das Kind mag, dass der Arzt immer besonders viel Mitgefühl zeigt.
Der Senior weiß, wem der freundlichen Pfleger sehr stark ähnelt.
Die Joggerin vermutet, dass der Hunde ohne Leine nicht sofort in den Wald rennt.
Der Vogel zwitscherte, weil er im letzten Moment dem Kater entkam.
Der Nachbarsjunge bittet, endlich sein Lieblingstier als Haustierhalten zu dürfen.

9.2.Experiment 2 (nom, acc)

9.2.1.Test material

9.2.1.1.har-nomacc = hierarchy harmonic nominative-accusative mismatch

Sehr erfolgreich investierte, wen letztens der Berater informiert hatte.
Sehr beruhigt lachte, wen inzwischen der Zugbegleiter beraten hatte.
Voller Überzeugung redete, wen damals der Anwalt unterstützt hatte.
Äußert ausgelassen feierte, wen vorhin der Kölner amüsiert hatte.
Gute Produkte erhielt, wen sofort der Kunde begrüßt hatte.
Keine Geduld besaß, wen sofort der Sohn korrigiert hatte.
Viele Qualifikationen besaß, wen tagsüber der Butler bedient hatte.
Voller Begeisterung arbeitete, wen zuerst der Soldat instruiert hatte.
Große Gewinne erwartete, wen ehemals der Anleger gemieden hatte.
Großen Hochmut bewies, wen neulich der Guru verhöhnt hatte.
Genügend Rabatt erzielte, wen soeben der Maler respektiert hatte.
Kleine Zuschüsse beantragte, wen vorhin der Azubi akzeptiert hatte.
Völlig aufgeregt reagierte, wen gestern der Geschädigte überführt hatte.
Eine Entschädigung erwirkte, wen zuletzt der Betroffene überrascht hatte.
Gute Nerven bewies, wen gerade der Lehrer getadelt hatte.
Ausreichend Stärke zeigte, wen vorgestern der Politiker kritisiert hatte.
Solide Annahmen formulierte, wen kürzlich der Gutachter beauftragt hatte.
Gute Schnittmuster entwarf, wen zuvor der Schneider bestärkt hatte.
Viel Trinkgeld ergatterte, wen vorher der Gast bejubelt hatte.
Großen Spaß bekundete, wen unlängst der Besucher gefeiert hatte.
Ausgesprochene Ruhe bewahrte, wen früher der Bauherr beschwichtigt hatte.
Sehr unkonzentriert handelte, wen soeben der Cousin abgelenkt hatte.
Völlig überrascht reagierte, wen gestern der Biologe beschimpft hatte.
Wenig Empathie empfand, wen heute der Matrose aufgeregt hatte.
Enorme Stärke bewies, wen damals der Rektor entlassen hatte.
Voller Hektik gestikulierte, wen zuvor der Arbeitgeber verwarnt hatte
Voller Adrenalin steckte, wen zuletzt der Sportler beeindruckt hatte.
Großen Enthusiasmus empfand, wen kürzlich der Künstler fasziniert hatte.
Viel Toleranz genoss, wen inzwischen der Teenager abgelenkt hatte.

Ohne Vorbehalt lächelte, wen früher der Schulfreund geärgert hatte.
Eine Beförderung erzielte, wen seinerzeit der Betriebsrat gelobt hatte.
Sehr gewitzt agierte, wen neulich der Mandant geachtet hatte.
Umfassende Beratungen bot, wen unlängst der Verkäufer ermuntert hatte.
Gute Stimmung verbreitete, wen heute der Kellner belustigt hatte.
Genaue Pläne entwarf, wen letztens der Regisseur beglückwünscht hatte.
Beträchtlichen Respekt erlangte, wen vorher der Bürgermeister geehrt hatte.
Viel Aufmerksamkeit erntete, wen gerade der Untertan bewundert hatte.
Voller Charisma steckte, wen ehemals der Anhänger vergöttert hatte.
Gerechten Zorn entwickelte, wen abends der Rivale beeinträchtigt hatte.
Alle Vorschriften beachtete, wen vorgestern der Fachmann benachteiligt hatte.

9.2.1.2. mat-nomnom = nominative match

Sehr erfolgreich investierte, wer letztens den Berater informiert hatte.
Sehr beruhigt lachte, wer inzwischen den Zugbegleiter beraten hatte.
Voller Überzeugung redete, wer damals den Anwalt unterstützt hatte.
Äußert ausgelassen feierte, wer vorhin den Kölner amüsiert hatte.
Gute Produkte erhielt, wer sofort den Kunden begrüßt hatte.
Keine Geduld besaß, wer sofort den Sohn korrigiert hatte.
Viele Qualifikationen besaß, wer tagsüber den Butler bedient hatte.
Voller Begeisterung arbeitete, wer zuerst den Soldaten instruiert hatte.
Große Gewinne erwartete, wer ehemals den Anleger gemieden hatte.
Großen Hochmut bewies, wer neulich den Guru verhöhnt hatte.
Genügend Rabatt erzielte, wer soeben den Maler respektiert hatte.
Kleine Zuschüsse beantragte, wer vorhin den Azubi akzeptiert hatte.
Völlig aufgeregt reagierte, wer gestern den Geschädigten überführt hatte.
Eine Entschädigung erwirkte, wer zuletzt den Betroffenen überrascht hatte.
Gute Nerven bewies, wer gerade den Lehrer getadelt hatte.
Ausreichend Stärke zeigte, wer vorgestern den Politiker kritisiert hatte.
Solide Annahmen formulierte, wer kürzlich den Gutachter beauftragt hatte.
Gute Schnittmuster entwarf, wer zuvor den Schneider bestärkt hatte.
Viel Trinkgeld ergatterte, wer vorher den Gast bejubelt hatte.
Großen Spaß bekundete, wer unlängst den Besucher gefeiert hatte.
Ausgesprochene Ruhe bewahrte, wer früher den Bauherrn beschwichtigt hatte.
Sehr unkonzentriert handelte, wer soeben den Cousin abgelenkt hatte.
Völlig überrascht reagierte, wer gestern den Biologen beschimpft hatte.
Wenig Empathie empfand, wer heute den Matrosen aufgeregt hatte.
Enorme Stärke bewies, wer damals den Rektor entlassen hatte.
Voller Hektik gestikulierte, wer zuvor den Arbeitgeber verwarnt hatte.
Voller Adrenalin steckte, wer zuletzt den Sportler beeindruckt hatte.
Großen Enthusiasmus empfand, wer kürzlich den Künstler fasziniert hatte.
Viel Toleranz genoss, wer inzwischen den Teenager abgelenkt hatte.
Ohne Vorbehalt lächelte, wer früher den Schulfreund geärgert hatte
Eine Beförderung erzielte, wer seinerzeit den Betriebsrat gelobt hatte.
Sehr gewitzt agierte, wer neulich den Mandanten geachtet hatte.
Umfassende Beratungen bot, wer unlängst den Verkäufer ermuntert hatte.
Gute Stimmung verbreitete, wer heute den Kellner belustigt hatte.
Genaue Pläne entwarf, wer letztens den Regisseur beglückwünscht hatte.

Beträchtlichen Respekt erlangte, wer vorher den Bürgermeister geehrt hatte.
Viel Aufmerksamkeit erntete, wer gerade den Untertan bewundert hatte.
Voller Charisma steckte, wer ehemals den Anhänger vergöttert hatte.
Gerechten Zorn entwickelte, wer abends den Rivalen beeinträchtigt hatte.
Alle Vorschriften beachtete, wer vorgestern den Fachmann benachteiligt hatte.

9.2.1.3. opp-accnom = hierarchy opposing accusative nominative mismatch

Der Kunde suchte, wer letztens den Berater informiert hatte.
Der Fahrgast beneidete, wer inzwischen den Zugbegleiter beraten hatte.
Der Journalist verdächtigte, wer damals den Anwalt unterstützt hatte.
Der Tourist kannte, wer vorhin den Kölner amüsiert hatte.
Der Filialleiter beglückwünschte, wer sofort den Kunden begrüßt hatte.
Der Vater umarmte, wer sofort den Sohn korrigiert hatte.
Der Besucher achtete, wer tagsüber den Butler bedient hatte.
Der Kamerad rief, wer zuerst den Soldaten instruiert hatte.
Der Banker besänftigte, wer ehemals den Anleger gemieden hatte.
Der Sympathisant diffamierte, wer neulich den Guru verhöhnt hatte.
Der Zuschauer bejubelte, wer soeben den Maler respektiert hatte.
Der Spezialist bezahlte, wer vorhin den Azubi akzeptiert hatte.
Der Sachverständige besuchte, wer gestern den Geschädigten überführt hatte.
Der Psychologe erreichte, wer zuletzt den Betroffenen überrascht hatte.
Der Schüler unterstützte, wer gerade den Lehrer getadelt hatte.
Der Reporter benannte, wer vorgestern den Politiker kritisiert hatte.
Der Mechaniker beschenkte, wer kürzlich den Gutachter beauftragt hatte.
Der Designer korrigierte, wer zuvor den Schneider bestärkt hatte.
Der Manager engagierte, wer vorher den Gast bejubelt hatte.
Der Gastgeber grüßte, wer unlängst den Besucher gefeiert hatte.
Der Architekt boykottierte, wer früher den Bauherrn beschwichtigt hatte.
Der Kriminelle verleumdete, wer soeben den Cousin abgelenkt hatte.
Der Chemiker belastete, wer gestern den Biologen beschimpft hatte.
Der Kapitän tröstete, wer heute den Matrosen aufgeregt hatte.
Der Beamte befragte, wer damals den Rektor entlassen hatte.
Der Freund umarmte, wer zuvor den Arbeitgeber verwarnt hatte.
Der Veranstalter erreichte, wer zuletzt den Sportler beeindruckt hatte.
Der Galerist duzte, wer kürzlich den Künstler fasziniert hatte.
Der Ausbilder beschuldigte, wer inzwischen den Teenager abgelenkt hatte.
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Der Chef respektierte, wer seinerzeit den Betriebsrat gelobt hatte.
Der Freund empfahl, wer neulich den Mandanten geachtet hatte.
Der Scout buchte, wer unlängst den Verkäufer ermuntert hatte.
Der Koch verpflegte, wer heute den Kellner belustigt hatte.
Der Schauspieler beneidete, wer letztens den Regisseur beglückwünscht hatte.
Der Wirt duzte, wer vorher den Bürgermeister geehrt hatte.
Der Prinz begnadigte, wer gerade den Untertan bewundert hatte.
Der Gelehrte ängstigte, wer ehemals den Anhänger vergöttert hatte.
Der Fan ermutigte, wer abends den Rivalen beeinträchtigt hatte.
Der Forscher erheiterte, wer vorgestern den Fachmann benachteiligt hatte.

9.2.1.4. mat-accacc = accusative match

Der Kunde suchte, wen letztens der Berater informiert hatte.
Der Fahrgast beneidete, wen inzwischen der Zugbegleiter beraten hatte.
Der Journalist verdächtigte, wen damals der Anwalt unterstützt hatte.
Der Tourist kannte, wen vorhin der Kölner amüsiert hatte.
Der Filialleiter beglückwünschte, wen sofort der Kunde begrüßt hatte.
Der Vater umarmte, wen sofort der Sohn korrigiert hatte.
Der Besucher achtete, wen tagsüber der Butler bedient hatte.
Der Kamerad rief, wen zuerst der Soldat instruiert hatte.
Der Banker besänftigte, wen ehemals der Anleger gemieden hatte.
Der Sympathisant diffamierte, wen neulich der Guru verhöhnt hatte.
Der Zuschauer bejubelte, wen soeben der Maler respektiert hatte.
Der Spezialist bezahlte, wen vorhin der Azubi akzeptiert hatte.
Der Sachverständige besuchte, wen gestern der Geschädigte überführt hatte.
Der Psychologe erreichte, wen zuletzt der Betroffene überrascht hatte.
Der Schüler unterstützte, wen gerade der Lehrer getadelt hatte.
Der Reporter benannte, wen vorgestern der Politiker kritisiert hatte.
Der Mechaniker beschenkte, wen kürzlich der Gutachter beauftragt hatte.
Der Designer korrigierte, wen zuvor der Schneider bestärkt hatte.
Der Manager engagierte, wen vorher der Gast bejubelt hatte.
Der Gastgeber grüßte, wen unlängst der Besucher gefeiert hatte.
Der Architekt boykottierte, wen früher der Bauherr beschwichtigt hatte.
Der Kriminelle verleumdete, wen soeben der Cousin abgelenkt hatte.
Der Chemiker belastete, wen gestern der Biologe beschimpft hatte.
Der Kapitän tröstete, wen heute der Matrose aufgeregt hatte.
Der Beamte befragte, wen damals der Rektor entlassen hatte.
Der Freund umarmte, wen zuvor der Arbeitgeber verwarnt hatte.
Der Veranstalter erreichte, wen zuletzt der Sportler beeindruckt hatte.
Der Galerist duzte, wen kürzlich der Künstler fasziniert hatte.
Der Ausbilder beschuldigte, wen inzwischen der Teenager abgelenkt hatte.
Der Erzieher ermahnte, wen früher der Schulfreund geärgert hatte.
Der Chef respektierte, wen seinerzeit der Betriebsrat gelobt hatte.
Der Freund empfahl, wen neulich der Mandant geachtet hatte.
Der Scout buchte, wen unlängst der Verkäufer ermuntert hatte.
Der Koch verpflegte, wen heute der Kellner belustigt hatte.
Der Schauspieler beneidete, wen letztens der Regisseur beglückwünscht hatte.
Der Wirt duzte, wen vorher der Bürgermeister geehrt hatte.
Der Prinz begnadigte, wen gerade der Untertan bewundert hatte.
Der Gelehrte ängstigte, wen ehemals der Anhänger vergöttert hatte.
Der Fan ermutigte, wen abends der Rivale beeinträchtigt hatte.
Der Forscher erheiterte, wen vorgestern der Fachmann benachteiligt hatte.

9.2.2. Fillers

9.2.2.1. Ungrammatical fillers

Der Spieler besiegte gestern den Gegner, obwohl er nicht den Favorit war.
Der Student befragt der Kommilitonen, denn der hat vorhin im Seminar genau mitgeschrieben.
Der Landwirt kontaktiert den Tierarzt, da ihn sich immer sehr um seine Pferde sorgt.
Der Angler fängt den Fisch, nachdem er den ganzen Tag in hüfthohes Wasser stand.
Äußerst überrascht reagiert der Schlosser, obwohl dem Kunde bereits vor zwei Tagen absagte.
Sehr zufrieden lacht der Tierwärter, weil ihm die Ente mit der Hand aufgezogen hat.
Besonders munter spielt den Junge, obwohl dieser heute eigentlich krank im Bett liegen sollte.
Sehr erfreut schwärmt der Rentner, denn den Pfleger nimmt sich immer besonders viel Zeit für ihn.
Mit Sorgfalt arbeitet der Praktikant, weil ihn später diesen Beruf ausüben möchte.
Mit viel Kreativität zaubert der Gärtner, sodass er häufig auf seinen tollen Tricks angesprochen wird.
Die Sekretärin bestellt einen Ordner, denn für die anstehende Betriebsfeier wird Sicherheitspersonal benötigt.
Der Händler erwartete den Läufer, obwohl er schon lang nicht mehr an der Spitze des Wettlaufes gelaufen ist.
Der Urlauber mag Hamburger, weil sie für die meisten Feste einfache und schnelle Snacks sind.
Der Musiker begutachtet den Flügel, um dem verletzten Vogel richtig helfen zu können.
Das Unternehmen errichtete letztlich eine Bank, damit die Senioren des Stadtteils eine Sitzmöglichkeit haben.
Der Spion übersah die Wanze, als sie langsam unter seinem Kissen hervorgekrochen kam.
Der Großvater bemerkte die Ente, sodass die Falschmeldung in der Zeitung zügig berichtigt werden konnte.
Der Florist begegnete dem Strauß, obwohl der Tierwärter bereits das Straußengehege abgeschlossen hatte.
Der Reiter entging dem Schimmel, weil er zuvor Chlorreiniger an die Wand gesprüht hatte.
Der Student entkam dem Kater, weil die nette Dame ihn vorhin mit Katzenfutter gelockt hatte.
Der Mann begegnete dem Berliner, den er unverzüglich kaufte und noch in der Bäckerei aß.
Der IT-Experte folgte der Maus, da diese sich wochenlang in dem PC-Tower ein Nest gebaut hatte.
Das Mädchen folgte der Mutter, die in der Werkstatt gerade aus dem Schraubenkasten gefallen war.
Der Abenteurer entkam der Schlange, da neben ihm zügig eine neue Kasse öffnete.
Der Tourist ruft den Reiseleiter, um mit ihm den weiteren Verlauf der Reise zu besprechen.
Der Hotelangestellte begutachtete den Aufzug, da er in letzter Zeit häufiger Probleme gemacht hatte.
Der Sänger begeisterte den Kritiker, obwohl dieser anfangs eine schlechte Meinung von ihm hatte.
Der Fan motiviert den Boxer, um ihm für die letzte Runde die nötige Kraft zu geben.
Der Imker untersucht den Bienenstock, damit selbst kleinste Beschädigungen entdeckt

werden.
Der Mann ist der Tierparkwärter, denn er hat stets genug Einfühlungsvermögen für den Beruf gezeigt.
Der Sohn wurde Apotheker, da bereits viele Verwandte von ihm Apotheker waren.
Der Hund bleibt Spürhund, weil er stets problemlos ohne Leine dem Halter folgt.
Die Maus ist die Überlegene, weil sie schneller als die Katze in ihrem Versteck war.
Die Katze wurde das Haustier, obwohl das Mädchen eigentlich schon immer Ratten lieber hatte.
Mit dem Projekt angefangen werden kann erst, wenn noch einige Schnellhefter bestellt werden.
Voller Motivation rannte der Sportler, obwohl er schon am Ende des Halbmarathons war.
Interessanterweise legt die Umfrage nahe, dass Kieler ruhige und ehrliche Menschen sind.
Angestrengt überlegt die Studentin, wer das angeschlagene Tier artgerecht unterbringen kann.
Mit großem Engagement versuchte die Firma, durch die gestrige Errichtung einer Bank für Senioren ihr Image aufzubessern.
Aufgeregt wurde gewartet, obwohl der Tierwärter das Außengehege längst geschlossen hatte.
Ausgiebig ermittelt der Jockey, wen gestern das Pferd abgeworfen hatte.
Großes Gejaule stoppte, nachdem eine Anwohnerin den Kater sofort mit Katzenfutter gestärkt hatte.
Große Enttäuschung herrschte, weil sich ein weiterer Berliner in dem Resort aufhielt.
Oft spekuliert wurde, dass sich jahrelang eine Maus hinter dem PC versteckt hatte.
Mit Verunsicherung fragte der Wirt, wen der Wanderer bis zum Gipfel mitnehmen kann.
Wenig hoffnungsvoll untersucht der Angestellte, wer den Drucker nun endlich repariert hat.
Viele Lieder begeisterten, sodass der Reporter dem Konzert eine volle Zeitungsseite zuteilte.
Etwas Zuspruch half, dem Spieler für die letzte Halbzeit ausreichend Motivation zu geben.
Ganz sicher weiß der Pilger, wem seine Armbanduhr in den Ameisenhaufen gefallen war.
Enormes Vertrauen entstand, da der Arzt immer besonders viel Mitgefühl gezeigt hatte.
Sicher weiß der Senior, wem der freundlichen Pfleger sehr stark ähnelt.
Etwas Misstrauen bleibt, obwohl der Hund ohne Leine nicht sofort in den Wald rannte.
Viel Aufregung entfachte, weil der Vogel im letzten Moment dem Kater entkam.
Etwas Erwartung besteht, dass der Nachbarsjunge endlich ein Haustier halten darf.
Äußerst ekelerregend war, dass häufig eine Spinne über den Teppich kroch.
Vollkommen unauffällig war, dass sich eine Gans im Gras versteckt hatte.
Sehr überraschend war, dass die Großmutter sich in dem Dorf bereits auskannte.
Enormer Ärger drohte, da neulich trotz des hohen Andrangs keine neue Kasse öffnete.

9.3. Experiment 3 (nom, dat)

9.3.1. Test material

9.3.1.1. har-nomdat = hierarchy harmonic nominative-dative mismatch

Sehr erfolgreich investierte, wem letztens der Berater geantwortet hatte.
Sehr beruhigt lachte, wem inzwischen der Zugbegleiter geantwortet hatte.
Voller Überzeugung redete, wem damals der Anwalt geholfen hatte.

Äußert ausgelassen feierte, wem vorhin der Kölner geholfen hatte.
Gute Produkte erhielt, wem sofort der Kunde gedankt hatte.
Keine Geduld besaß, wem sofort der Sohn gedankt hatte.
Viele Qualifikationen besaß, wem tagsüber der Butler gedient hatte.
Voller Begeisterung arbeitete, wem zuerst der Soldat gedient hatte.
Große Gewinne erwartete, wem ehemals der Anleger misstraut hatte.
Großen Hochmut bewies, wem neulich der Guru misstraut hatte.
Genügend Rabatt erzielte, wem soeben der Maler gehorcht hatte.
Kleine Zuschüsse beantragte, wem vorhin der Azubi gehorcht hatte.
Völlig aufgeregt reagierte, wem gestern der Geschädigte verziehen hatte.
Eine Entschädigung erwirkte, wem zuletzt der Betroffene verziehen hatte.
Gute Nerven bewies, wem gerade der Lehrer widersprochen hatte.
Ausreichend Stärke zeigte, wem vorgestern der Politiker widersprochen hatte.
Solide Annahmen formulierte, wem kürzlich der Gutachter assistiert hatte.
Gute Schnittmuster entwarf, wem zuvor der Schneider assistiert hatte.
Viel Trinkgeld ergatterte, wem vorher der Gast applaudiert hatte.
Großen Spaß bekundete, wem unlängst der Besucher applaudiert hatte.
Ausgesprochene Ruhe bewahrte, wem früher der Bauherr vergeben hatte.
Sehr unkonzentriert handelte, wem soeben der Cousin vergeben hatte.
Völlig überrascht reagierte, wem gestern der Biologe gedroht hatte.
Wenig Empathie empfand, wem heute der Matrose gedroht hatte.
Enorme Stärke bewies, wem damals der Rektor gekündigt hatte.
Voller Hektik gestikulierte, wem zuvor der Arbeitgeber gekündigt hatte.
Voller Adrenalin steckte, wem zuletzt der Sportler imponiert hatte.
Großen Enthusiasmus empfand, wem kürzlich der Künstler imponiert hatte.
Viel Toleranz genoss, wem inzwischen der Teenager getrotzt hatte.
Ohne Vorbehalt lächelte, wem früher der Schulfreund getrotzt hatte.
Eine Beförderung erzielte, wem seinerzeit der Betriebsrat vertraut hatte.
Sehr gewitzt agierte, wem neulich der Mandant vertraut hatte.
Umfassende Beratungen bot, wem unlängst der Verkäufer geschmeichelt hatte.
Gute Stimmung verbreitete, wem heute der Kellner geschmeichelt hatte.
Genaue Pläne entwarf, wem letztens der Regisseur gratuliert hatte.
Beträchtlichen Respekt erlangte, wem vorher der Bürgermeister gratuliert hatte.
Viel Aufmerksamkeit erntete, wem gerade der Untertan gehuldigt hatte.
Voller Charisma steckte, wem ehemals der Anhänger gehuldigt hatte.
Gerechten Zorn entwickelte, wem abends der Rivale geschadet hatte.
Alle Vorschriften beachtete, wem vorgestern der Fachmann geschadet hatte.

9.3.1.2. mat-datdat = dative match

Der Kunde gehorchte, wem letztens der Berater geantwortet hatte.
Der Fahrgast vertraute, wem inzwischen der Zugbegleiter geantwortet hatte.
Der Journalist widersprach, wem damals der Anwalt geholfen hatte.
Der Tourist trotzte, wem vorhin der Kölner geholfen hatte.
Der Filialleiter gratulierte, wem sofort der Kunde gedankt hatte.
Der Vater half, wem sofort der Sohn gedankt hatte.
Der Besucher gehorchte, wem tagsüber der Butler gedient hatte.
Der Kamerad imponierte, wem zuerst der Soldat gedient hatte.
Der Banker drohte, wem ehemals der Anleger misstraut hatte.

Der Sympathisant huldigte, wem neulich der Guru misstraut hatte.
Der Zuschauer applaudierte, wem soeben der Maler gehorcht hatte.
Der Besitzer dankte, wem vorhin der Azubi gehorcht hatte.
Der Sachverständige trotzte, wem gestern der Geschädigte verziehen hatte.
Der Psychologe widersprach, wem zuletzt der Betroffene verziehen hatte.
Der Schüler assistierte, wem gerade der Lehrer widersprochen hatte.
Der Reporter imponierte, wem vorgestern der Politiker widersprochen hatte.
Der Mechaniker half, wem kürzlich der Gutachter assistiert hatte.
Der Designer kündigte, wem zuvor der Schneider assistiert hatte.
Der Manager vertraute, wem vorher der Gast applaudiert hatte.
Der Gastgeber schmeichelte, wem unlängst der Besucher applaudiert hatte.
Der Architekt misstraute, wem früher der Bauherr vergeben hatte.
Der Kriminelle schadete, wem soeben der Cousin vergeben hatte.
Der Biologe schadete, wem gestern der Biologe gedroht hatte.
Der Kapitän vergab, wem heute der Matrose gedroht hatte.
Der Beamte verzieh, wem damals der Rektor gekündigt hatte.
Der Freund diente, wem zuvor der Arbeitgeber gekündigt hatte.
Der Veranstalter antwortete, wem zuletzt der Sportler imponiert hatte.
Der Galerist verzieh, wem kürzlich der Künstler imponiert hatte.
Der Ausbilder kündigte, wem inzwischen der Teenager getrotzt hatte.
Der Erzieher diente, wem früher der Schulfreund getrotzt hatte.
Der Chef gratulierte, wem seinerzeit der Betriebsrat vertraut hatte.
Der Freund schmeichelte, wem neulich der Mandant vertraut hatte.
Der Scout assistierte, wem unlängst der Verkäufer geschmeichelt hatte.
Der Koch dankte, wem heute der Kellner geschmeichelt hatte.
Der Schauspieler applaudierte, wem letztens der Regisseur gratuliert hatte.
Der Wirt antwortete, wem vorher der Bürgermeister gratuliert hatte.
Der Prinz vergab, wem gerade der Untertan gehuldigt hatte.
Der Gelehrte drohte, wem ehemals der Anhänger gehuldigt hatte.
Der Fan huldigte, wem abends der Rivale geschadet hatte.
Der Forscher misstraute, wem vorgestern der Fachmann geschadet hatte.

9.3.1.3. opp-datnom = hierarchy opposing dative-nominative mismatch

Der Kunde gehorchte, wer letztens dem Berater geantwortet hatte.
Der Fahrgast vertraute, wer inzwischen dem Zugbegleiter geantwortet hatte.
Der Journalist widersprach, wer damals dem Anwalt geholfen hatte.
Der Tourist trotzte, wer vorhin dem Kölner geholfen hatte.
Der Filialleiter gratulierte, wer sofort dem Kunden gedankt hatte.
Der Vater half, wer sofort dem Sohn gedankt hatte.
Der Besucher gehorchte, wer tagsüber dem Butler gedient hatte.
Der Kamerad imponierte, wer zuerst dem Soldaten gedient hatte.
Der Banker drohte, wer ehemals dem Anleger misstraut hatte.
Der Sympathisant huldigte, wer neulich dem Guru misstraut hatte.
Der Zuschauer applaudierte, wer soeben dem Maler gehorcht hatte.
Der Besitzer dankte, wer vorhin dem Azubi gehorcht hatte.
Der Sachverständige trotzte, wer gestern dem Geschädigten verziehen hatte.
Der Psychologe widersprach, wer zuletzt dem Betroffenen verziehen hatte.
Der Schüler assistierte, wer gerade dem Lehrer widersprochen hatte.

Der Reporter imponierte, wer vorgestern dem Politiker widersprochen hatte.
Der Mechaniker half, wer kürzlich dem Gutachter assistiert hatte.
Der Designer kündigte, wer zuvor dem Schneider assistiert hatte.
Der Manager vertraute, wer vorher dem Gast applaudiert hatte.
Der Gastgeber schmeichelte, wer unlängst dem Besucher applaudiert hatte.
Der Architekt misstraute, wer früher dem Bauherrn vergeben hatte.
Der Kriminelle schadete, wer soeben dem Cousin vergeben hatte.
Der Biologe schadete, wer gestern dem Biologen gedroht hatte.
Der Kapitän vergab, wer heute dem Matrosen gedroht hatte.
Der Beamte verzieh, wer damals dem Rektor gekündigt hatte.
Der Freund diente, wer zuvor dem Arbeitgeber gekündigt hatte.
Der Veranstalter antwortete, wer zuletzt dem Sportler imponiert hatte.
Der Galerist verzieh, wer kürzlich dem Künstler imponiert hatte.
Der Ausbilder kündigte, wer inzwischen dem Teenager getrotzt hatte.
Der Erzieher diente, wer früher dem Schulfreund getrotzt hatte.
Der Chef gratulierte, wer seinerzeit dem Betriebsrat vertraut hatte.
Der Freund schmeichelte, wer neulich dem Mandanten vertraut hatte.
Der Scout assistierte, wer unlängst dem Verkäufer geschmeichelt hatte.
Der Koch dankte, wer heute dem Kellner geschmeichelt hatte.
Der Schauspieler applaudierte, wer letztens dem Regisseur gratuliert hatte.
Der Wirt antwortete, wer vorher dem Bürgermeister gratuliert hatte.
Der Prinz vergab, wer gerade dem Untertan gehuldigt hatte.
Der Gelehrte drohte, wer ehemals dem Anhänger gehuldigt hatte.
Der Fan huldigte, wer abends dem Rivalen geschadet hatte.
Der Forscher misstraute, wer vorgestern dem Fachmann geschadet hatte.

9.3.1.4. mat-nomnom = nominative match

Sehr erfolgreich investierte, wer letztens dem Berater geantwortet hatte.
Sehr beruhigt lachte, wer inzwischen dem Zugbegleiter geantwortet hatte.
Voller Überzeugung redete, wer damals dem Anwalt geholfen hatte.
Äußert ausgelassen feierte, wer vorhin dem Kölner geholfen hatte.
Gute Produkte erhielt, wer sofort dem Kunden gedankt hatte.
Keine Geduld besaß, wer sofort dem Sohn gedankt hatte.
Viele Qualifikationen besaß, wer tagsüber dem Butler gedient hatte.
Voller Begeisterung arbeitete, wer zuerst dem Soldaten gedient hatte.
Große Gewinne erwartete, wer ehemals dem Anleger misstraut hatte.
Großen Hochmut bewies, wer neulich dem Guru misstraut hatte.
Genügend Rabatt erzielte, wer soeben dem Maler gehorcht hatte.
Kleine Zuschüsse beantragte, wer vorhin dem Azubi gehorcht hatte.
Völlig aufgeregt reagierte, wer gestern dem Geschädigten verziehen hatte.
Eine Entschädigung erwirkte, wer zuletzt dem Betroffenen verziehen hatte.
Gute Nerven bewies, wer gerade dem Lehrer widersprochen hatte.
Ausreichend Stärke zeigte, wer vorgestern dem Politiker widersprochen hatte.
Solide Annahmen formulierte, wer kürzlich dem Gutachter assistiert hatte.
Gute Schnittmuster entwarf, wer zuvor dem Schneider assistiert hatte.
Viel Trinkgeld ergatterte, wer vorher dem Gast applaudiert hatte.
Großen Spaß bekundete, wer unlängst dem Besucher applaudiert hatte.
Ausgesprochene Ruhe bewahrte, wer früher dem Bauherrn vergeben hatte.

Sehr unkonzentriert handelte, wer soeben dem Cousin vergeben hatte.
Völlig überrascht reagierte, wer gestern dem Biologen gedroht hatte.
Wenig Empathie empfand, wer heute dem Matrosen gedroht hatte.
Enorme Stärke bewies, wer damals dem Rektor gekündigt hatte.
Voller Hektik gestikulierte, wer zuvor dem Arbeitgeber gekündigt hatte.
Voller Adrenalin steckte, wer zuletzt dem Sportler imponiert hatte.
Großen Enthusiasmus empfand, wer kürzlich dem Künstler imponiert hatte.
Viel Toleranz genoss, wer inzwischen dem Teenager getrotzt hatte.
Ohne Vorbehalt lächelte, wer früher dem Schulfreund getrotzt hatte.
Eine Beförderung erzielte, wer seinerzeit dem Betriebsrat vertraut hatte.
Sehr gewitzt agierte, wer neulich dem Mandanten vertraut hatte.
Umfassende Beratungen bot, wer unlängst dem Verkäufer geschmeichelt hatte.
Gute Stimmung verbreitete, wer heute dem Kellner geschmeichelt hatte.
Genaue Pläne entwarf, wer letztens dem Regisseur gratuliert hatte.
Beträchtlichen Respekt erlangte, wer vorher dem Bürgermeister gratuliert hatte.
Viel Aufmerksamkeit erntete, wer gerade dem Untertan gehuldigt hatte.
Voller Charisma steckte, wer ehemals dem Anhänger gehuldigt hatte.
Gerechten Zorn entwickelte, wer abends dem Rivalen geschadet hatte.
Alle Vorschriften beachtete, wer vorgestern dem Fachmann geschadet hatte.

9.3.2. Fillers

9.3.2.1. Ungrammatical fillers

Triumphierend gewinnt der Sportler, obwohl er nicht den Favorit war.
Hocherfreut lacht den Kommilitonen, denn der hat im Seminar genau mitgeschrieben.
Aufgeregt telefoniert der Bauer, da ihn sich sehr um seine Pferde sorgt.
Erkältet schnieft der Angler, nachdem er den ganzen Tag in hüfthohes Wasser stand.
Ungeduldig wartet dem Mechaniker, obwohl der Kunde bereits vor zwei Tagen absagte.
Die Ente folgt dem Tierwärter, weil er ihr mit der Hand aufgezogen hat.
Das Kind begegnet der Freund, obwohl dieser eigentlich krank im Bett liegen sollte.
Der Rentner gefällt des Pflegers, denn der nimmt sich immer besonders viel Zeit.
Der Praktikant genügt dem Angestellten, weil er alle er gestellten Aufgaben erfüllt.
Der Gärtner ähnelt dem Zauberer, sodass er häufig auf seinen tollen Tricks angesprochen wird.

9.3.2.1. Grammatical fillers

Hastig bestellt wird ein Ordner, denn für die anstehende Betriebsfeier wird Sicherheitspersonal benötigt.
Rasch geordert wird der Läufer, obwohl er nicht mehr an der Spitze des Wettlaufes gelaufen ist.
Besonders beliebt sind Hamburger, weil sie einfache, schnelle Snacks sind.
Gründlich begutachtet wird der Flügel, um dem verletzten Vogel richtig helfen zu können.
Zügig errichtet wurde eine Bank, damit die Senioren eine Sitzmöglichkeit haben.
Verdächtig wirkte die Wanze, als sie unter seinem Kissen hervorgekrochen kam.
Sofort bemerkt wurde die Ente, sodass die Falschmeldung berichtigt werden konnte.
Der Florist begegnete dem Strauß, obwohl der Tierwärter das Straußengehege abgeschlossen hatte.

Der Reiter entging dem Schimmel, weil er zuvor Chlorreiniger an die Wand gesprüht hatte.
Der Student entkam dem Kater, weil die nette Dame ihn mit Katzenfutter gelockt hatte.
Der Mann begegnete dem Berliner, den er unverzüglich gekauft und noch in der Bäckerei gegessen hat.
Der IT-Experte folgte der Maus, da diese sich in dem PC-Tower ein Nest gebaut hatte.
Das Mädchen folgte der Mutter, die aus dem Schraubenkasten gefallen war.
Der Abenteurer entkam der Schlange, da neben ihm zügig eine neue Kasse öffnete.
Verwirrt schaute der Tourist, da einige Punkte der Reiseplanung noch unsicher waren.
Voll konzentriert handelte der Angestellte, da der Aufzug in letzter Zeit häufiger Probleme gemacht hatte.
Absolut begeistert reagierte der Kritiker, obwohl dieser anfangs eine schlechte Meinung vom Sänger hatte.
Voller Eifer motivierte der Fan, um dem Boxer für die letzte Runde die nötige Kraft zu geben.
Sorgfältig agierte der Imker, damit selbst kleinste Beschädigungen am Bienenstock entdeckt werden.
Der Esel folgt dem Tierparkwärter, denn dieser hat immer viel Einfühlungsvermögen gezeigt.
Der Rentner ähnelt dem Apotheker, sodass sie viele Kollegen für Verwandte halten.
Der Hund entlief dem Sportler, weil er ohne Leine durch den Wald rannte.
Die Maus entkommt der Katze, weil sie schnell genug in ihr Versteck zurückkehrte.
Das Pferd gehört dem Mädchen, obwohl eigentlich Ratten ihre Lieblingstiere sind.
Die Hilfskraft assistiert, weil noch einige Helfer für Projekte fehlen.
Der Hobbysportler rennt, obwohl er am Ende des Halbmarathons läuft.
Der Reisende glaubt, dass Kieler ruhige und ehrliche Menschen sind.
Die Studentin fragt, wer das angeschlagene Tier artgerecht unterbringen kann.
Die Firma versuchte, durch die Errichtung einer Bank für Senioren ihr Image aufzubessern.
Der Zoobesucher wartete, obwohl der Tierwärter das Außengehege längst geschlossen hatte.
Der Jockey untersucht, wen gestern das Pferd abgeworfen hatte.
Der Igel gedieh, nachdem eine Anwohnerin ihn mit Katzenfutter gestärkt hatte.
Der Urlauber glaubt, dass sich ein weiterer Berliner in dem Resort aufhielt.
Der Jugendliche glaubt, dass sich eine Maus hinter dem PC ungeschickt versteckt hatte.
Der Wanderer fragte, wen er bis zum Gipfel mitnehmen kann.
Die Angestellte überprüft, wer den Drucker nun endlich repariert hat.
Der Maler begeisterte, sodass der Reporter dem Artikel eine volle Zeitungsseite zuteilte.
Der Trainer versuchte, dem Spieler für die letzte Halbzeit ausreichend Motivation zu geben.
Der Pilger untersuchte, wem seine Armbanduhr in den Ameisenhaufen gefallen war.
Das Kind vertraut, weil der Arzt immer besonders viel Mitgefühl zeigt.
Der Senior weiß, wem der freundlichen Pfleger sehr stark ähnelt.
Die Joggerin vermutet, dass der Hunde ohne Leine nicht sofort in den Wald rennt.
Der Vogel imponiert, weil er im letzten Moment dem Kater entkam.
Der Nachbarsjunge bittet, endlich sein Lieblingstier als Haustierhalten zu dürfen.
Der Agent sah, dass eine Spinne über den Teppich kroch.
Der Großvater bemerkte, dass sich eine Gans im Gras versteckte.
Das Mädchen folgte, weil die Großmutter sich in dem Dorf besser auskannte.
Der Draufgänger lächelte, da wegen des hohen Andrangs eine neue Kasse öffnete.