The Relation between Pronouns and Definites. Evidence from First Language Acquisition.

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Ich widme diese Dissertation allen, die nicht wissen, wohin sie im Leben wollen.
Traut euch zu träumen und habt keine Angst vor Umwegen.

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Introduction

1.1 Main Aim

In the grand scheme of things, the main aim of this dissertation is to add to the overarching goal of modern linguistics: to map formal linguistic theory to empirical evidence in the domain of definites and pronouns with evidence from first language acquisition, as illustrated in Figure 1.1.
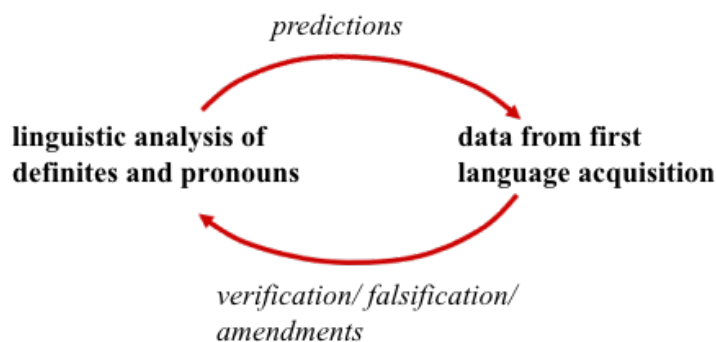
Figure 1.1: Main Aim

On the one hand, a linguistic analysis provides predictions about which sentences or structures should occur in natural language and which structures should be unavailable. On the other hand, natural language as it is actually used serves as a collection of data to see which structures are indeed observed as available and to revise the linguistic analyses if

necessary. Both aspects complement each other and are necessary in any investigation of natural language. As a case study for this duality of theory and empirical observation, I investigate the acquisition of the definites and pronouns and its relation to formal theory. By studying the acquisition of these phenomena, insights can be gained about how language learners arrive at an adult-like understanding and production of the phenomena and which aspects of their grammar might aid the learner along the way, pointing back to how they are analysed. Two main questions capture this main aim and will guide the process within this dissertation:

(1) Which predictions do the formal linguistic analyses of pronouns and definites provide for natural language use, and here especially for first language acquisition?

(2) Which repercussions for a formal analysis of definites and pronouns follow from the observation of language development?

I will introduce two formal analyses of definites and pronouns which make different predictions for a language learner's pathway to an adult-like use. In a next step, I want to find out if the empirical observation of the learner's behaviour can reveal which formal account is better compatible with it. With this investigation, I hope to gain further insights for the modelling of the semantics-pragmatics interface, its language acquisition and their interaction.

In the following, I will give a short introduction in Section 1.2 into the phenomena considered, pronouns and definites. Then, I will give an overview of the structure of this dissertation in section 1.3. In Section 1.4, I will once more highlight how this dissertation connects to current research. Finally, I will introduce the general linguistic framework assumed throughout in section 1.5.

1.2 The Phenomena

1.2.1 Pronouns

The following example illustrates why - from a linguistic point of view - pronouns serve as an appropriate choice for studying the semantics-pragmatics interface and its acquisition.

(3) **Friends: The One with Joey's New Girlfriend** (Season 4, Episode 5) [1]

(Chandler is talking to Monica and notices a beautiful woman.)

Chandler: Ohh, she's pretty. Pretty ahh, pretty girl, the pretty–she's pretty.

Monica: Just go up to her and ask her out. (Chandler laughs) Oh, what's the worst thing that could happen?

Chandler: I could die.

[...]

Chandler: All right, I'm gonna do it! I'm gonna get shot down. Any advice?

Monica: Just be yourself. But, not too much.

Chandler: (gets up) (softly) Wish me luck.

Ross: (loudly) Good luck!

Chandler: Wish it! (To the woman, Kathy, he likes) Hi. Hi, I-I was just sitting over there, and uhh, Chandler. My name is Chandler. Did I say that?

Kathy: No, you didn't. Hi, I'm Kathy.

Chandler: Uh Kathy, with K or a C?

Kathy: With a K.

Chandler: Oh-oh-hey!

Kathy: Wow! You are really good at this.

Chandler: Hey, come on, give me a break, I'm out on a limb here.

Kathy: I'm sorry, you're right, I apologize, but I should tell you that I'm waiting for a date. (Joey enters) Oh, and there he is now.

Joey: Hey!

Chandler: Hey! Hey, hey-hey, hey. (Joey kisses Kathy.)

Joey: Hey, I see you guys already met, huh?

Chandler: Yes-yes, I was just trying to figure out a way to uh, demonstrate how I could get my exceptionally large feet into my even bigger mouth.

Joey: Didn't I tell ya? Always showin' off.

In this passage of a dialogue within the series 'Friends', we can observe how pronouns are used in natural conversations. Here, Chandler sees a woman sitting at a table. He is

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[1]Source: https://fangj.github.io/friends/, retrieved December 19th, 2017; ([39])

attracted to her and wants to talk to Monica about it. Because Chandler uses the pronoun 'she' deictically by accompanying his pronoun use with him looking at the girl, Monica immediately knows who he is talking about without him having to introduce the girl into their conversation linguistically, e.g. by saying 'Do you see the girl over there? She's pretty.' They immediately use the third person pronoun 'she' or 'her' in order to refer to the beautiful girl, Kathy. For the audience, the identification of the right referent for Chandler's use of 'she' is aided by the camera and how the scene is set up: Kathy is made salient. Then, as soon as the conversational situation changes, the mapping between discourse referents and pronouns changes as well. Chandler walks up to Kathy to introduce himself. Now, he switches from using a third person pronoun to the indexical pronoun 'you' to talk to Kathy, as she is now participating in the conversation. When Joey enters the café, Kathy uses the pronoun 'he' to refer to the date she is expecting. Yet again, she uses the pronoun 'he' deictically, and the camera once more establishes Joey as the appropriate referent.

In this short passage, multiple different pronouns are used to refer to the same discourse referents: Kathy is referred to with 'she' and 'you', Joey is referred to with 'he', 'you' and 'I'. In other words, the meaning of the individual pronouns is not anchored to one specific individual in the context, as it is the case for nouns ('table' always describes an actual table, 'apple' an apple, and so on) or proper names ('Saskia Brockmann' always refers to myself, no matter who uses this name), but its meaning shifts each time the situation changes. Its meaning is **context sensitive**. Its meaning cannot be determined by the semantics alone, but we need information of the context to fully interpret it. This means that in order to capture the meaning of pronouns, we have to know more about the context and which pronouns can refer to which discourse participants. The indexical pronouns 'I' and 'you' refer to discourse participants, each time the one who is currently speaking or who is currently being addressed, respectively. The third person pronouns 'she' or 'he' refer to discourse referents who have been introduced previously, are salient and match the gender requirements of the pronoun. Most often, the referents mapped to third person pronouns are not directly participating in the conversation, but are rather the topic of conversation. We thus see that quite elaborate information about the discourse roles of each individual present in any situation is neccesary in order to find the right pronoun. Also, the context seems to distinguish between different discourse roles an individual can have: directly

participating or not, being salient or not. In the example above, all these components are fulfilled when the pronouns are used. The conversation is perceived as natural and understood effortlessly, because the context is fully specified by the setup of the scene and by the camera.

As example (3) has demonstrated, **free uses of personal pronouns** exemplify the context-sensitivity and referentiality of pronouns in the nominal domain. Their referentiality makes a comparison to definites necessary, as definites are refential as well (see below). Thus, commonalities and differences between these two phenomena have to be taken into account for a linguistic analysis. The following overview will introduce traditional concepts of pronominal categorization and will introduce a first descriptive definition of free uses of personal pronouns.

The Cambridge Grammar of English identifies five main categories of pronouns (see Table 1.1).

Category	Personal	Reciprocal	Interrogative	Relative	Temporal
Examples	*I, you, he, she, it, we, they*	*each other, one another*	*who, which*	*who, which*	*today, yesterday*

Table 1.1: Categorization of Pronoun Types in Huddleston and Pullum (2014,[58]): 425

In the categories in Table 1.1, quite different linguistic aspects play a role. Reciprocal pronouns differ from personal pronouns in that they invoke a relation between two individuals rather than the identification of one single individual in the context. Interrogative and relative pronouns trigger alternative individuals that are all possible answer candidates for the question. These involve focus semantics (see Rooth (1992,[96]), something that won't be relevant for the endeavor of this dissertation. Lastly, temporal pronouns make reference to times and not individuals. I will concentrate on the first category, i.e. personal pronouns: they make reference to specific individuals in a given context, and it is this property specifically that will be central to this dissertation.

A distinction is often made by traditional grammar between deictic and anaphoric uses of personal pronouns (see the discussions in Heim and Kratzer (1998,[54]:239) or Büring (2012,[14]). Deictic uses are defined as uses of e.g. third person pronouns, where a ref-

erent is identified by way of actually pointing at the individual in the context (see (4)). Anaphoric uses are identified as those cases where a referent has been introduced in the same linguistic context, i.e. in the same or previous sentence (see (5)).

(4)   Child: He (*pointing at a boy next to him*) stole the cookies!

(5)   Christopher was in the kitchen. He stole the cookies!

However, in both cases, the mechanism responsible for the interpretation of the pronoun is the same. We map some salient referent from the context to the pronoun, be it the actual situation of utterance or the linguistic situation. Since the distinction between deictic and anaphoric uses is not useful in the context of the linguistic analyses I will propose, I will make use of a different categorization of pronouns which allows to distinguish between pronoun uses on a different level.

Personal pronouns can be further divided into three subclasses (cf. Huddleston and Pullum (2014,[58]): 426). As illustrated with the help of (3) above, we have seen that indexical pronouns refer to discourse participants, while third person pronouns refer to salient non-discourse participants. In both cases, and in the above example, they have been used **referentially**, i.e. referring to one specific individual in the context. However, in certain sentence structures, pronouns do not refer to a specific individual in the context, but rather are dependent on the subject of the clause.

(6)   Every girl turns to her mother for advice once in a while.

In one reading of (6) above, the pronoun 'her' can refer to some salient female referent in the context. For example, imagine there is one girl, let's say Rory, whose mother, let's say Lorelai, is especially wise so that all the other relevant girls turn to Lorelai for advice once in a while (see the paraphrase for such a reading in (7) below). However, there is a second reading of (6), where every girl turns to her own mother for advice (see the paraphrase in (8)).

(7)   Every girl turns to *Rory's mother Lorelai* for advice.

(8)   Every girl turns to her own mother for advice, i.e. Lane turns to Lane's mother, Paris turns to Paris' mother etc.

In the latter case, the pronoun 'her' is used **non-referentially**, as it rather denotes each relevant girl in turn and does not pick out one specific girl. This reading is brought about by the syntax, such that 'her' will be syntactially and semantically bound by the DP 'every girl'. In the former case, the interpretation of 'her' does not depend on syntacto-semantic binding, it is free, i.e. only dependent on the context alone, nothing else. Similar to the reading in (8), the interpretation of reflexive pronouns, the third subclass of personal pronouns, also comes about through syntactic binding. In (9), 'herself' is referential in that it necessarily refers to Sandra, while it is nonreferential in (10), where it necessarily refers to each relevant girl in turn, similar to (6).

(9) Sandra lives by herself.

(10) Every girl doubts herself.

Table 1.2 below summarizes how the different subcategories of personal pronouns can be categorized according to their referentiality. They are either free, i.e. receiving an interpretation by the context alone, and thus are always referential. Or they are bound, i.e. receiving their interpretation through their syntactic relation to a c-commanding element. When the c-commanding element refers to a specific individual (see e.g. (9)), the pronoun is referential and necessarily refers to that same individual. When the c-commanding element is a quantified DP, as in (6) or (10), the pronoun is non-referential.

Subclass	Discourse Role	Free (& Referential)	Bound (& Referential)	Bound (& Non-Referential
Indexicals	Participants	✓	-	✓ (some cases)
Third Person	Non-Participants	✓	✓	✓
Reflexives	Both	-	✓	✓

Table 1.2: Subcategorization of Personal Pronouns

I will briefly discuss bound cases of pronouns in Chapter 2 in order to introduce central arguments of one of the two views on the analysis of pronouns. However, for the purposes of this dissertation, I will concentrate on free uses of pronouns, as in these cases it is the context alone which brings about their interpretation, rather than the syntax of the sentence. With free uses, it is central how the information about the context is encoded and which discourse role is assigned to the referent (cf. example (3) above).

1.2.2 Definites

What about definites? As pronouns, they are context sensitive and refential, but in a different way. Consider the following example.

(11) **Friends: The One where Ross and Rachel Take a Break** (Season 3, Episode 15) [2]
(Scene: A nightclub, Chandler and Joey are talking to Chloe.)
Chloe: (seeing Ross enter) Hey, it's the dinosaur guy. (runs over to Ross) Hi, Ross.
Ross: Oh, hi Chloe.

When Chloe sees Ross, she introduces him with a definite DP 'the dinosaur guy'. As she probably does not know his actual name, she needs some defining property of Ross' that will help identify him for her conversational partners. Similar to a third person pronoun, she refers to a non-participant of the conversation. However, the mapping between definite article and Ross does not change. Like for proper names, Ross will always be the referent for 'the dinosaur guy' in this given situation. Still, the connection between the definite article and the context is different from pronouns. The definite article is always referential, it always refers to a specific referent in the discourse. But the way to map the definite article to its referent happens differently than with pronouns. A pronoun gives very little information about its referent, other than its gender. This is why pronouns can only access salient referents in the context. The definite article 'the' in English necessarily combines with an NP complement, in (11) above 'dinosaur guy'. The NP complement, through its semantic meaning, already gives us the relevant property that has to apply to the referent picked out by the definite article. We thus know that whoever is meant has to be a dinosaur guy, irrespective of contextual information. The information provided by the context about the referent, so the context-sensitive part of the definite article, is that the referent in the context must a) exist and must be b) unique. When Chloe uses 'the dinosaur guy', the utterance is only felicitous if there exists somebody that can be described as a dinosaur guy in the first place, and there can only be one uniquely identifiable dinosaur guy. This is the case here; she is talking about Ross. However, if she were to utter this sentence at a palaeontological conference, for example, reactions of her conversational participants

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[2]Source: https://fangj.github.io/friends/, retrieved December 20th, 2017; ([39])

would likely be to ask 'Which dinosaur guy do you mean?', something described as the 'Hey, Wait a Minute'-Effect by Kai von Fintel (cf. von Fintel (2004,[36])).

How does the definite article differ from other articles? The obvious comparison is the indefinite article 'a' in English. The indefinite article, as in (3) above, when Kathy tells Chandler that she is waiting for 'a date', just refers to the existence of an available referent, but does not necessarily specifiy which specific referent is meant. The definite article in turn does specify exactly who or what is meant.

In other words, when a definite article is uttered, we have to be able to map it to some previously introduced referent in the context who can be unambiguously identified. Thus, the discourse role of this referent is not as important as in the case of pronouns, but rather the status of the information about this referent within the previous discourse. The previous discourse has to single this referent out as unique. Consequently, for the definite article, we have to be able to distinguish given and new information in a context and, even more importantly, track given information for uniquely identifiable discourse referents. The definite article thus gives insights into yet another important aspect of the context.

Other uses of the definite article are its combination with a plural (see (12)) or its combination with a superlative (see (13)).

(12) The books are on the table.

(13) She ran the fastest she had ever run (Huddleston and Pullum (2014,[58]): 371, example (7))

In (12), there has to exist a uniquely identifiable, maximal set of books, so both the requirement of existence and of uniqueness (rephrased as maximality) are given, even with a plural NP complement. Thus, the interpretation of the plural definite shares those defining properties with its singular use which will be central to this dissertation. In (13), the definite article identifes the unique degree of maximal speed. Uniqueness is thus also given here, just that the definite article operates on another domain than the domain of individuals. Thus, the investigation of the singular definite article with an NP complement provides all the information relevant for me and shares the important context-sensitive properties with its additional uses.

Other related determiners are demonstratives.As they also presuppose existence and uniqueness, they fall under the category of definites. In addition to existence and uniqueness, they

make reference to spacially close or farther away objects within a context. I will go into more detail about demonstratives in Chapter 2.

Overall, pronouns and definites are context-sensitive phenomena which are drawing attention to different regularities of how context information is encoded and how the mapping between the individuals in the context and the linguistic phenomena that mark them works. Personal, referential pronouns evoke a classification of discourse referents as participants or non-participants and salient or non-salient non-participants, and definites track given information in a discourse and the previously introduced referents and their uniqueness.

1.3 Structure of this Dissertation

The following structure shall serve the overarching goal to find answers for (1) and (2), by exemplifying this issue with the acquisition of the definite article and pronouns.

In Chapter 2, I will illustrate how the mapping between formal analysis and natural language use looks like in the formal analysis of pronouns and definites and its combination with language acquisition. This mapping will be addressed from two sides: in section 2.1, I will first discuss how the formal analysis can be modelled. Here, I will introduce two competing accounts. On the one hand, the classical view analyses pronouns as variables that receive their interpretation directly through the context, modelled by a variable assignment function g. Definites receive their interpretation through a restriction: the context has to provide a unique referent (see section 2.1.1). On the other hand, the uniform view argues that pronouns should be analysed in parallel to definites in that here, a restriction on the context provides a referent for pronouns as well (see section 2.1.2). As I will be concerned with language acquisition as a specific aspect of natural language use, the two competing views will be defined as two distinct versions of a target grammar for language learners. And indeed, both accounts model an adult-like use of pronouns and definites. In language acquisition, it is this adult-like use which children have to learn. Second, in section 2.2, I will concentrate on language acquisition as a tool to observe natural language use, or rather, how natural language use is learnt in the first place. As the previous section provides two versions of a target grammar, this section will be concerned with the question how children could arrive at such grammars. Defining pathways in language acquisition to the different target grammars will lead the way to empirically testing the claims made

by the uniform and classical view. I will arrive at three specific research questions that can be seen as guiding the empirical investigation of the following chapters and ultimately contributing to the main questions above.

Chapter 3 and 4 present the empirical investigation of the research questions formulated on the basis of the discussion in chapter 2. In chapter 3, I will discuss two studies on the production of monolingually English and German learning children as collected in corpora of children's spontaneous speech in the CHILDES database (MacWhinney (2000,[72])). As the uniform view predicts that pronouns and the definite article come with an interdependent compositional analysis, the hypothesis for the production of pronouns and definites arises that they should come online in dependence of each other. Results show that even though especially in the English corpora, definites and pronouns indeed come online within a very short time frame, a recurring pattern cannot be observed. In chapter 4, I present an experiment on children's comprehension of the definite article and pronouns, paying specific attention to the context-sensitive nature of the phenomena. This experiment is a necessary addition to the production data, as children's comprehension is tested and the contextual requirements as met in the situation are controlled for, contrary to the production data, where the situational context can only partly be reconstructed. Results show that in their comprehension of pronouns, already three-year-olds indeed pick a salient referent. However, it is unclear whether three-year-olds know that the definite article targets unique referents, or if rather, the task was not able to capture children's sensitivity to uniqueness in the first place.

Chapter 5 provides a general discussion of the empirical results in light of the research questions in Chapter 2 and connects the findings back to the overall aim of this dissertation as captured in research question (1) and (2).

1.4   Contribution of this Dissertation

Overall, this dissertation directly contributes to the investigation of the interdependence of linguistic theory and empirical observation, by looking at the acquistion of pronouns and the definite article. Specifically, language acquisition will provide evidence contributing to a deeper understanding of the analysis of pronouns and definites, and by extension of the semantics-pragmatics interface. The analysis of pronouns and definites and their rela-

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tion integrates syntactic, semantic and pragmatic meaning components. This dissertation integrates all three aspects and shows how their interaction leads to a complex analysis of the phenomena at hand. By offering a complex linguistic analysis of these phenomena, linguists often ignore that consequently, the learner's task has to cope with this complexity. This work offers a window into a deeper understanding of how the acquisition process in the case of pronouns and definites looks like and if the model of the target grammar provided by linguistic theory can account for this process.

1.5   Notes on the Framework

For the theoretical analysis of pronouns and definites, I will assume a basic framework of compositional interpretation following Heim and Kratzer (1998,[54]). This framework will be extended to notions of context-sensitivity and other aspects of meaning that will become relevant for the interpretation of the respective phenomena in chapter 2.

Heim and Kratzer's framework (1998,[54]) is inspired by Frege's notion of compositionality. The meaning of a sentence comes about through the combination of the meaning of its parts (see Heim and Kratzer 1998: 2). More precisely, Heim and Kratzer model the meaning of a sentence by constructing its structure as phrase structure trees. In that way, syntax is a prerequisite for any semantic analysis. The phrase structure trees give information about the individual elements of the sentence and their relationship to each other. The individual elements within the trees are interpreted with the help of semantic types (see (14)).

(14)   **Semantic Types**

   (a) e and t are semantic types.

   (b)   If σ and τ are semantic types, then $< \sigma, \tau >$ is a semantic type.

   (c)   Nothing else is a semantic type.

(15)   **Semantic Denotation Domains**

   (a) $D_e := D$ (the set of individuals)

   (b) $D_t := \{0, 1\}$ (the set of truth-values)

(c)   For any semantic types σ and τ, $D_{<\sigma,\tau>}$ is the set of all functions from D_σ to D_τ.

(Heim and Kratzer (1998,[54]: 28)

A semantic composition of any sentence will be type-driven (cf. Heim and Kratzer 1998,[54]: 43). A type-driven composition will model some of the individual elements as functions and some as arguments, depending on how they are defined in the lexicon. The combination of a function-argument pair is mediated with the help of the composition rule 'Function Application'.

(16)   **Function Application**:
If α is a branching node, $\{\beta, \gamma\}$ is the set of α's daughters, and $[\![\beta]\!]$ is a function whose domain contains $[\![\gamma]\!]$, then $[\![\alpha]\!] = [\![\beta]\!]([\![\gamma]\!])$.
(Heim and Kratzer 1998: 44)

An extensional model of sentence meaning, as introduced here, assumes that sentence meanings can be defined as truth-conditions, i.e. the sentence gives the necessary information that states which things have to be the case for the sentence to be potentially true in a given situation.

(17)   My dissertation is on the relation between pronouns and definites.

To give an example, (17) is true as long as Saskia Brockmann's dissertation is about the relation between pronouns and definites. If this is the case, then the sentence can be assigned the truth-value 1, for true. Combining the individual elements of a sentence by Function Application will ultimately result in having calculated under which conditions the sentence receives the truth-value 1, i.e. a sentence receives the semantic type t. This, of course, might be too simplistic, as natural language takes not only the actual situation of my writing here and now into account, but often refers to things that could have been or that will be in the future. These possible extensions of an extensional composition will be discussed once they become relevant in the following chapter, as well as all other additional aspects necessary for the interpretation of pronouns and the definite article in particular.

Chapter 2

The Learner's Problem

How do infants, given their cognitive abilities and the information given in the input, master a complex target grammar in only a few years? This chapter discusses this question by focusing on children's acquisition of pronouns and definites.

Pronouns and definites are both referential[1], i.e. they refer to specific individuals within the context. In the case of pronouns, these referents have to be salient and are most often non-participants of the conversation. In the case of definites, the referent has to be uniquely identifiable. Thus, pronouns and the definite article are both context-sensitive. How is this context-sensitivity encoded in linguistic theory? I will discuss in depth two competing approaches.

The first view, which I call the classical view, is an account of how formal semanticists have traditionally thought about the relevant constructions. A textbook introduction is given in Heim and Kratzer (1998,[54]), for example. Roughly, third person pronouns are here analysed as indexed variables that are mapped to a referent via a contextually determined variable assignment function. The definite article, on the other hand, has been analysed as triggering a presupposition of uniqueness. Importantly, two different tools are used for integrating contextual information. The variable assignment function on the one hand, and the presupposition imposing restrictions on the utterance on the other hand.

The second view , which I term the uniform view, reanalyses third person pronouns. Essentially, what Elbourne (2005, [30]; 2013,[32]) suggests is that third person pronouns are definites in disguise, where the context provides a relevant (silent) NP complement

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[1]Disregarding bound uses and other, kind-denoting readings of the definite for now.

of the pronoun. Here, the context-sensitivity is encoded the same way as in the classical analysis of the definite article. Importantly, the uniform view proposes that the interpretation of third person pronouns and definites is **interdependent**, i.e. the interpretation of pronouns follows the interpretation of definites. In the classical view, the analyses of both constructions is unrelated. Both approaches will be introduced in section 2.1. An in-depth discussion of the two views is an essential step in order to answer how children's language acquisition looks like by specifying the goal of acquiring pronouns and definites. Both the uniform and classical view are very clear models of the target grammar of a learner.

However, defining what the target grammar has to look like is not enough. While formal semanticists can quite neatly pin down the analysis of a construction in all its fine-grained facettes, they are not as much concerned with the problem language learner's are facing. Given the often underspecified and imperfect input, how can a learner possibly get to understand all these well defined fine-grained differences in the target grammar? Here, a view from the field of language acquisition becomes necessary. The purpose of section 2.2 is to show how a learner can possibly arrive at the target grammar. Acquisitionists are well informed about children's linguistic milestones in language acquisition in general, and at which stage the acquisition of referential expressions takes place. Here, I will zoom in on the question as to how, once children have mastered all necessary prerequisites for acquiring pronouns and definites, children can then proceed in figuring out the more fine-grained realm of different means to express referentiality given the information provided by the caretaker's input. Together with the target grammar formulated in 2.1, this description of the complexity of the learner's task will lead to two distinct pathways of acquisition, one taking into accout a uniform grammar, the other a classical grammar. These pathways will then be the basis for formulating specific hypotheses for the production and comprehension of pronouns and definites relevant for the following chapters.

Thus, the overall aim of this chapter is to structure insights of both generative grammar and language acquisition, so as to arrive at a clear picture about the complex task of learning pronouns and definites, alongside a good understanding of what it actually is that learners are acquiring.

2.1 The Target Grammar

In this section, I want to introduce each approach, the uniform (section 2.1.2) and classical one (section 2.1.1), in detail. In addition to pronouns and the definite article, I will take into account the interpretation of indexicals and demonstratives. These constructions are related to pronouns and the definite article. Their interpretation as captured by the uniform and classical view is thus complementing that of pronouns and definites. After having introduced the accounts in detail, I will go on with a necessary revision of both analyses in section 2.1.3.

2.1.1 The Classical View

The Classical View (CV) includes the most standard analyses of each phenomenon in turn. I will closely follow the textbook introduction given in Heim and Kratzer (1998,[54]).

Interpretation of Third Person Pronouns

Pronouns, according to Heim and Kratzer (1998,[54]), are variables that are interpreted relative to a variable assignment function g. Heim and Kratzer (1998) define a variable as a "terminal symbol α [...] iff there are assignments a and a' such that $[\![\alpha]\!]^a \neq [\![\alpha]\!]^{a'}$." (Heim and Kratzer (1998,[54]): 116). This definition is able to capture the context sensitive nature of third person pronouns. The mapping of a referent to one and the same pronoun can change from context to context. This is different from elements which are not context-sensitive in the same way, or rather whose interpretation is constant across contexts. Heim and Kratzer (1998,[54]:116) define such elements as constants: "A terminal symbol α is a *constant* iff for any two assignments a and a', $[\![\alpha]\!]^a = [\![\alpha]\!]^{a'}$." The variable assignment function g is responsible for mapping a variable, or to be more precise, the index of the pronoun, with a contextually salient referent. This is captured with the *Pronouns and Traces Rule*:

(18) **Pronouns and Traces Rule**:
   If α is a pronoun or trace, i is an index, and g is a variable assignment whose domain includes i, then $[\![\alpha]\!]^g = g(i)$.
   (Heim and Kratzer (1998,[54]: 241)

According to the rule in (18), g is a partial function taking indices as arguments and returning discourse participants. It is partial, because it may not define each index-referent mapping that there is, but it has to include at least all those mappings for which an index occurs freely in a sentence, i.e. is not bound. In other words, an interpretation of a pronoun can only be felicitous if the context provides a suitable referent. This is captured by the *Appropriateness Condition* in (19) below:

(19) **Appropriateness Condition**:
A context c is *appropriate* for an LF ϕ only if c determines a variable assignment g_c whose domain includes every index which has a free occurrence in ϕ.
(Heim and Kratzer (1998,[54]): 243)

For example, a pronoun like 'he' comes with an index, say 1. The variable assignment function g takes this index and maps it to the corresponding referent, say John (see the example below).

(20) (a) *John is asleep. He works a lot.*

(b) $[\![he_1]\!]^g = g(1) = $ *John*

(c) $[\![$ works a lot $]\!]([\![he_1]\!]^g) = 1$ iff *John* works a lot.

Syntactically, Heim and Kratzer analyse pronouns as Determiner Phrases, DPs, where the variable sits in the D head. Semantically, they are type $<e>$ variables.
Heim and Kratzer (1998) analyse gender features as partial identity-functions left-adjoined to the DP (cf. as well Cooper (1983,[24]). To be more precise, their meaning is **presuppositional** in that they require the context to provide a suitable referent for which the gender feature is true, i.e. in (21) below a female referent. If this requirement is not met, the whole sentence is undefined, i.e. it cannot receive any interpretation. Presuppositional content here is defined as information that is not asserted, but as having been already established as given in the current discourse (speaking in terms of Stalnaker (1978,[111]), presuppositions refer back to information which is part of the Common Ground, while asserted content contributes information which is then added to the Common Ground by virtue of asserting it (see for a more detailed explanation and a formal implementation Stalnaker (1978,[111]). If some part of the sentence is contributing to the presuppositional content

rather than to the asserted content and this information does not match the information established in the Common Ground, the sentence will be perceived as inappropriate rather than as being clearly false.

(21)

```
                              DP
                          ╱       ╲
                  [feminine]      DP
                                   │
                                   D'
                                   │
                                   D
                                   │
                                  she₁
```
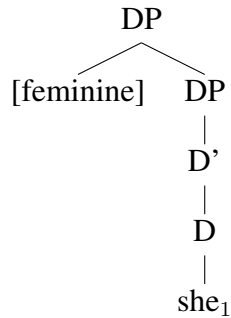
(22) $[\![feminine]\!] = \lambda x : x$ is female. x

(23) A and B in a dialogue.
      A: Peter is such a funny guy!
      B: Yes, I totally agree. # Just yesterday, she made this killer joke about a priest and a rabbi!
      A: Wait - who?

As exemplified in the ficticious dialogue in (23), B using a female pronoun in order to refer to Peter is not ungrammatical per se, as technically, one can compute the meaning of the sentence. It is also not clearly false, as it does not target the fact of Peter making the joke. Instead, B's utterance is inappropriate, as highlighted with A's reaction (this reaction has been captured by von Fintel as the 'Hey, wait a minute!'-effect, see von Fintel (2004,[36])). The lack of a suitable female referent prevents the whole sentence to be matched with a truth-value, as something goes wrong way before the assignment of a truth-value. This breakdown of the compositional interpretation is termed a presupposition failure. Presupposition failure makes the difference between presuppositions and assertions visible.

Coming back to the presuppositional analysis of gender features in particular, 'she₁' is interpreted via the variable assignment function, or to be more specific, via the *Pronouns and Traces Rule*, and is combined with the other node via *Function Application*. If 'she' would refer to a male referent, interpretation would fail, as the identity function picks out

only those referents which are female. Thus, this would lead to a typical presupposition failure as explained above.

Before continuing with indexical pronouns and their interpretation, let me come back to cases of bound pronouns. The Appropriateness Condition above targets only free uses of pronouns[2]. In the introduction, we have seen that there are further uses of pronouns, namely bound variables. Even though binding will not be central to the main issue adressed in this dissertation, it will become briefly relevant in explaining the origins of the uniform view and in explaining more complex cases of indexical pronoun use below. This is why I will briefly sketch it here.

(24)   Every girl turns to her mother for advice once in a while.

Consider the example repeated from the introduction in (24). Remember that this sentence comes with a reading where 'her' is not read referentially, but it is read non-referentially in being mapped to each girl within the group of relevant girls in turn. This reading is achieved by semantically binding the variable to the subject 'every girl'.

(25)

$$
\begin{array}{c}
\text{IP} \\
\hline
\text{DP} \quad \text{1} \quad \text{IP} \\
\text{every girl}_1 \\
\text{t}_1 \quad \text{I'} \\
\text{I} \quad \text{VP} \\
\text{V'} \\
\text{V} \quad \text{PP} \\
\text{turns} \quad \text{to her}_1 \text{ mother}
\end{array}
$$
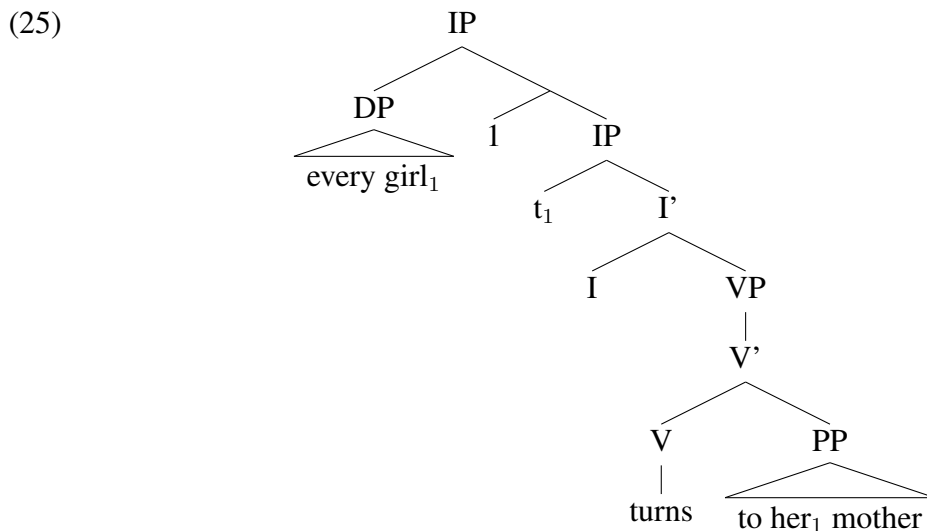
In Heim and Kratzer (1998), it is assumed that the quantified DP 'every girl' moves to the left edge of the IP and thus creates a trace in the subject-position (see (25)). This trace is

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[2]And remember that here, we assume that free uses include both deictic and anaphoric uses of pronouns. See Del Prete and Zucchi (2017,[89]) for an analysis which concentrates on the analysis of deictically interpreted pronouns. For the purposes of this dissertation, I will continue in subsuming deictic and anaphoric uses under free uses.

then bound by a Lambda Binder (the '1' in the tree). The pronoun 'her' then, is coindexed with the trace and the binder and can be interpreted with the help of the rule 'Predicate Abstraction'.

(26) **Predicate Abstraction**[3]

If α is a branching node whose daughters are β_i and γ, where β is a binder, and $i \in |N|$, then for any variable assignment g, $[\![\alpha]\!]^g = \lambda x : x \in D.[\![\gamma]\!]^{[i \to x]}$ (modified from Heim and Kratzer (1998,[54]:114).

In other words, as soon as we encounter a binder in the LF, the Predicate Abstraction rule applies and all variables that are within the scope of the binder and whose index is targeted by it will be reanalysed to the open argument of the predicate, resulting in the following truth-conditions.

(27) $[\![(24)]\!]^g = 1$ iff $\forall x[x$ is a girl $\to x$ turns to x's mother$]$

Importantly, the meaning of a pronoun stays the same even in bound environments - the binder just forces the variable assignment to map the index to the variable of the predicate. In the discussion of the uniform view below, we will see more problematic cases of binding where such a uniformity between the interpretation of bound and free uses can't be maintained.

To summarize, third person pronouns in the classical view are interpreted as variables, both in their free and bound occurrence. Their context-sensitivity is captured by modeling the variable assignment function g. Accordingly, the actual interpretation of a pronoun can not be achieved on the semantic level alone but needs the input of g, determined contextually.

Interpretation of Indexical Pronouns

As we have already seen in the Introduction, there is a decisive difference between indexical and third person pronouns. The former always refer to *discourse participants*, the latter most often refer to *non-discourse participants*. The mapping between indexical pronouns

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[3]Binding in Heim and Kratzer is derived by movement. However, an alternative is to assume a binding operator in the LF (see Büring (2012,[14]):983 for details). The overall interpretation of the sentence and the interpretation of the variable stay the same, however, and this is why I will disregard this possibility here.

and their referents shifts each time the speaker of the utterance changes, while the mapping between third person pronouns and their referents can stay constant in one particular context. In other words, the connection between indexical pronouns and the context seems to be closer than the connection between third person pronouns and the context.

Another fact that highlights the different behaviour of third person and indexical pronouns is their binding behaviour.

(28) Every man likes *my/your/his* mother.

(29) Every man likes **myself/*yourself/himself*. (examples taken from Grosz and Zobel (2014,[47]))

The sentence in (28) is only ambiguous when 'his' is used. In this case, 'his' could either refer to the mother of one specific, salient man, say John, or it could refer to each man's mother. In the first interpretation 'his' is free, in the second, 'his' is bound. The same ambiguity is not present for 'my' and 'your'. In these cases, the indexical pronouns unambiguously refer to either the speaker's or the addressee's mother, respectively. Similarly, 'myself' and 'yourself' can't be used in (29), as reflexive pronouns are obligatorily bound. Cases like these have led to the assumption that indexical pronouns can never be bound[4]. For these reasons, Kaplan (1989, [63]) argues that indexical pronouns must receive a stricter interpretation than third person pronouns, because they do not only refer to some salient referent, but this referent has to be either the speaker or the addressee[5]. Again, the interpretation is obligatorily context-dependent, but this context-dependency is encoded differently. Kaplan argues that each utterance has to be interpreted relative to the context, where the context is defined as a tuple of contextual parameters (see (30) below): the time c_T, the world c_W, the speaker c_S and the addressee c_A in the context.

(30) context $c = < c_T, c_W, c_S, c_A >$

To say it differently, each utterance has to be able to directly refer to one of these parame-

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[4]Disregarding 'fake indexicals' for now (see Heim 2008,[52] and Kratzer 2009,[68]). See also footnote 27 on page 42.

[5]Podobryaev (2017,[86]) argues that indexicals should not be treated as a uniform class. He backs this argument with analyzing imposters. For simplicity's sake, I will stick to the simpler analysis introduced in the following section.

ters, i.e. these have to be specified for each utterance[6]. Importantly, indexical pronouns are not interpreted with the help of g but rather are directly interpreted relative to the context c. To be more specific, the indexical pronouns 'I' and 'you' are equivalent to the contextual parameters 'c_S' and 'c_A', respectively (see (31) below).

(31) (a) $[\![I]\!]^{g,c} = c_S = $ *Saskia*

    (b) *I am hungry.*

    (c) $[\![$ hungry $]\!](c_s) = 1$ iff *Saskia* (speaker in c) is hungry.

In this framework, indexical pronouns are still D-heads syntactically. Semantically, they don't come with an index, but receive their interpretation directly through the context.

Uniformity of Third Person and Indexical Pronouns (Heim 2008,[52])

In the previous two sections, third person pronouns have been analysed as variables, while indexical pronouns have been analysed as contextual parameters. However, as we have seen in the introduction, traditional grammar has considered both as subtypes of the same class of constructions, namely personal pronouns. This classification is not supported by the analyses above. However, Heim (2008,[52]), following Dowty and Jacobson (1989,[27]), Schlenker (2002,[101]) and Sauerland (2003,[99]), proposes an analysis of third person and indexical pronouns that is able to capture uniformity, while preserving the specific closeness of context and indexicals. This combination of a uniform basis and distinct contextual relationships is achieved by extending the presuppositional analysis of gender features also for number and person. Above, gender features have been defined as partial identity functions that combine with its sister via Function Application but which restrict possible referents for the variable to the relevant property defined in the feature. In (21) above, this was exemplified with the pronoun 'she' which can only refer to female

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[6]Please note that I simplify considerably here: I will rather introduce the basic ideas of Kaplan (1989, [63]) and translate them into a Heim and Kratzer (1998,[54]) framework right away. For Kaplan, there is a distinction between *context* of evaluation and *circumstance of evaluation*, resulting for him in three levels of meaning: the "character", the "content" and the "denotation" of an utterance. The "character" can be defined as a function from contexts to intensions; the "content" is what in a Heim and Kratzer Framework (1998,[54]) would qualify as a sentence's intension and the "denotation" of a sentence is its extensional expression. See Kaplan (1989, [63]) for more details and his own formal implementation of these three levels. For the purposes of the theoretical discussion here, these further issues are not relevant.

referents, as captured by (22). Heim's (2008,[52]) approach decomposes pronouns into a pronoun bearing an index - the variable, and the identity functions triggering presuppositions. The difference now is that number and person will be captured as partial identity functions as well (see an overview in the following examples).

(32) gender:
$[\![$ masculine $]\!] = \lambda x_e : x$ is male. x
$[\![$ feminine $]\!] = \lambda x_e : x$ is female. x
(Heim (2008): 36, example (3))

(33) number:
$[\![$ singular $]\!] = \lambda x_e : x$ is an atom. x
$[\![$ plural $]\!] = \lambda x_e : x$ is a plurality. x[7]

(34) person:
$[\![$ 1st $]\!] = \lambda x_e : x$ includes c_S. x
$[\![$ 2nd $]\!] = \lambda x_e : x$ includes c_A and excludes c_S. x
$[\![$ 3rd $]\!] = \lambda x_e : x$ excludes c_S and c_A. x[8]

Personal pronouns in this framework are all indexed, and thus are all interpreted with the variable assignment g, even indexical pronouns. Additionally, the relevant identity functions contribute the missing information. For indexical pronouns, their deictic nature is not encoded directly anymore, but is preserved indirectly, as the person features '1st' and '2nd' make direct reference to the contextual parameters c_S and c_A. In other words, by decomposing pronouns into a variable and a variety of features, we now arrive at the same intuitve meanings of the respective pronouns but in a uniform way, as exemplified by the interpretation of the pronouns 'I', 'we' and 'she' below.

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[7]For the most part of this dissertation, I will ignore plural pronouns, as they don't add to the main issue of this work.

[8]This presupposition might be too strong. Heim (2008) discusses certain readings of bound reflexives where the exclusion of speaker and addressee seems to be inadequate. However, this problem is not central to the topic of this dissertation, as I will not consider the interpretation of bound pronouns extensively. The interested reader may want to read up on this issue in Heim (2008,[52]): 37, discussion of example (5)) and Sauerland (2003,[99]).

(35)   a) $[\![I_6]\!]^{g,c} = $

$$
\left[\!\!\left[
\begin{array}{c}
\text{DP} \\
\diagup \diagdown \\
\text{1st} \quad\quad \text{DP} \\
\diagup\diagdown \\
\text{singular} \quad \text{DP} \\
\frown \\
6
\end{array}
\right]\!\!\right]^{g,c}
$$

   b) $[\![I_6]\!]^{g,c}$ is defined iff $g(6)$ is an atom including c_S. If so, $[\![I_6]\!]^{g,c} = g(6)$.

(36)   a) $[\![we_7]\!]^{g,c} = $

$$
\left[\!\!\left[
\begin{array}{c}
\text{DP} \\
\diagup \diagdown \\
\text{1st} \quad\quad \text{DP} \\
\diagup\diagdown \\
\text{plural} \quad \text{DP} \\
\frown \\
7
\end{array}
\right]\!\!\right]^{g,c}
$$

   b) $[\![we_7]\!]^{g,c}$ is defined iff $g(7)$ is a plurality including c_S. If so, $[\![we_7]\!]^{g,c} = g(7)$.

(37)   a) $[\![she_3]\!]^{g,c} = $

$$
\left[\!\!\left[
\begin{array}{c}
\text{DP} \\
\diagup \diagdown \\
\text{3rd} \quad\quad\quad \text{DP} \\
\diagup\diagdown \\
\text{singular} \quad\quad \text{DP} \\
\diagup\diagdown \\
\text{feminine} \quad \text{DP} \\
\frown \\
3
\end{array}
\right]\!\!\right]^{g,c}
$$

   b) $[\![she_3]\!]^{g,c}$ is defined iff $g(3)$ is a female atom excluding c_s and c_A. If so, $[\![she_3]\!]^{g,c} = g(3)$.

To summarize, the account proposed by Heim (2008,[52]) is attractive insofar as it gives third person and indexical pronouns a uniform analysis, different from treating pronouns as variables on the one hand, and indexicals as contextual parameters on the other hand. Here, third person and indexical pronouns are decomposed into a variable that is interpreted the usual way, and its features, where number, person and gender are analysed as features and are treated as partial identity functions. This way, the specific connection of indexicals and the context is preserved, albeit indirectly through its 1st (or 2nd) person feature.

Interpretation of the Definite Article

For the analysis of the definite article, I will follow the presuppositional view once inspired by Frege[9] and argued for successfully in Heim and Kratzer (1998,[54]), Heim (2011,[53]), Elbourne (2005,[30]; 2013,[32]), Roberts (2005,[94]) and von Fintel,[36])[10]. Here, the notion of presuppositions which has already been introduced above becomes once more relevant. Heim and Kratzer (1998,[54]; among others named above) argue that the definite article triggers a presupposition of uniqueness, meaning that its interpretation can only be defined if there is exactly one unique referent in the context[11] that has the characteristics specified by the NP complement[12]. In the example below, the DP, and thus also the complete sentence, is only well-formed if there is only one uniquely available queen of England. If there were two or none, the sentence would be undefined.

(38) (a)   *The Queen of England is a greatgrandmother.*

      (b) $[\![the]\!]^{g,c} = \lambda f_{<e,t>} : \exists! x[f(x) = 1].\iota x[f(x) = 1]$

      (c) $[\![$ is a greatgrandmother $]\!]$ (the unique x such that x is the Queen of England) is defined iff there is a unique Queen of England. If so, then $[\![$ is a greatgrandmother $]\!]$ (the unique x such that x is the Queen of England) = 1 iff the unique x such that x is the Queen of England is a greatgrandmother.

---

[9]See a more detailed introduction into his thoughts on the definite article in Heim and Kratzer (1998,[54]) or Elbourne (2013,[32]).

[10]The most prominent competing view to this presuppositional analysis is to treat the definite article as asserting that the referent described by the NP complement has to be unique. This analysis is promoted by Russell (1905,[98]). See Heim (2011,[53]), von Fintel (2004,[36]) or Roberts (2005,[94]) for a more extensive discussion of the differences between such an analysis and the presently assumed one.

[11]I simplified a relevant discussion here in stating right away that the referent must be *contextually* unique. Indeed, we often make reference to 'the key', even if there are uncountable numbers of keys in the world. Intuitively though, we don't make reference to the whole world when talking about our key, but just to our current situation. However, the definition in (38b) doesn't express this. I will come back to contextual restriction of possible referents in the uniform view. However, an extension of the analysis where a covert domain restriction of the definite article is added can quite successfully capture this desired meaning component (see von Fintel (1994,[35])).

[12]More recent approaches to definiteness in general have suggested to treat definiteness as a feature, similar to the gender features above, restricting properties, rather than treating it as something lexically inherent to the definite article. Obviously, there are more expressions that express definiteness. However, decomposing the definite article into its assertive content and definiteness encoded as a partial function left-adjoined to the article wouldn't change the overall interpretation of the article. This is why I will stick to the standard analysis in (38b). See Heim (2011,[53]) for a more thorough discussion of the definiteness feature.

Just like third person and indexical pronouns, the definite article also sits in the D head. It is followed by an NP complement. The semantic interpretation though is quite different. The definite article serves as a (partial) functor of type $< et, e >$, mapping the interpretation of its NP argument to the unique referent in the context. The identification of the unique referent happens on a pragmatic level, but differently than in the pronoun or indexical case. Whereas pronouns need g and indexicals additionally c, the identification of the referent in the case of the definite article is encoded as a presupposition that has to be met by the context.

Familiarity

Before going on with the analysis of demonstratives under the classical view, let me discuss one further contextual requirement that has been identified for the definite article, specifically in its comparison with the indefinite article. Most famously, Heim (1982, [51]) argued that the definite article should be associated with familiarity, i.e. that the referent of the definite article has to be already established in the previous discourse. This is different from the use of an indefinite article, where the referent must be newly introduced into the discourse. She models the discourse requirements on the definite and indefinite article with a dynamic semantic framework (file change semantics)[13].

Heim gives examples that demonstrate the adequacy of the novelty/familiarity distinction. In (39), the first sentence with the indefinite NP 'a wine glass' introduces a new referent in the discourse that can then be taken as a referent for the definite article in the second sentence, 'the glass'. However, if we try to use the indefinite article in order to refer to this already introduced wine glass, we get an inapproriate utterance. 'A glass' in (40) cannot refer to the previously introduced wine glass, so it is odd to talk about yet another newly introduced wine glass and talk about its price right away.

(39)   A wine glass broke last night. The glass had been very expensive.

(40)   A wine glass broke last night. # A glass had been very expensive.
       (examples from Roberts 2003: 296)

---

[13]It is beyond the scope of this dissertation to go into detail about this framework. Let it suffice to say that it can model the introduction of specific referents into the discourse.

Roberts (2003,[94]) argues that the notion of familiarity as defined in Heim (1982,[51]) has to be revised because it is too restrictive. Heim (1982,[51]) defines familiarity as the linguistic introduction of a referent in the discourse. In other words, a linguistic element, such as the DP 'a wine glass' in (39) above, explicitly introduces this wine glass into the discourse. However, this is not the only way a referent can be introduced and taken as a referent for a definite DP. Roberts (2003,[94]) discusses the following example:

(41) Context: A woman is standing at a street corner on a rainy day when a car turns
       the corner, running through a big puddle of water and splashing her. She turns to
       a neraby on-looker and says:
       'What a day! [A bus]$_F$ splashed me, too, earlier this morning.'
       Roberts (2003,[94]): 298, example (16))

In (41), the additive particle 'too' with the focus marking on the DP 'a bus' presupposes that something other than the bus has splashed the woman. And indeed, the situation reveals that it was the car which splashed her right now. However, the car is not explicitly named in her utterance, but is only referred to contextually by 'too'. Consequently, the presupposition of 'too' is only satisified if it can target information given nonverbally in the context. Together with the discussion of additional examples (see Roberts (2003,[94]: pages 294 - 306)), Roberts argues that a distinction between strong and weak familiarity has to be made. The former concerns linguistically introduced referents, most commonly by the interpretation of a DP. The latter concerns non-linguistically referents, whose existence can be infered directly from the context (see Roberts' taxonomy in (42) below). In light of the examples she discusses, Roberts argues that definites require only weak familiarity. I will assume as much for the purposes of this dissertation.

(42) Taxonomy of familiarity:

      (a) strong familiarity: the NP has as antecedent a discourse referent introduced
           via the utterance of a (usually) preceding NP

      (b) weak familiarity:

           – the entity referred to is perceptually accessible to the interlocutors
           – the entity referred to is globally familiar in the general culture or at least
              among the participants in the discourse, although not mentioned in the

immediate discourse

– introduction of the NP's discourse referent is licensed solely by contextual existence entailments

– weak familiarity is guarateed by giving a functional interpretation to the definite description (as in bridging-examples)

Roberts (2003,[94]: 304, example (29))

The analysis of definites has thus to be extended to cover familiarity. An adapted and simplified version of the familiarity presupposition and the denotation of 'the' is given below. Here, I do not account for how the identification and mapping of a referent can be modelled dynamically. Instead, I introduce familiarity in parallel to uniqueness above within a static framework.

(43) $[\![the]\!]^{g,c} = \lambda f_{<e,t>} : \exists! x[f(x) = 1 \& FAM_w(x)].\iota x[f(x) = 1]$

(44) $[\![FAM]\!]^{g,c} = \lambda x.x$ is weakly familiar in c as defined in (42b).

Weak familiarity applies to both definites and pronouns. In (45) below, the pronoun 'it' can be used in the second sentence to refer back to the wine glass introduced by the indefinite in the first sentence, just like the definite in (39).

(45) A wine glass broke last night. It had been very expensive.

However, if we consider the 'appropriateness condition' in (19) above, we realize that it already establishes familiarity, so that for now, we don't need to encode familiarity as a presupposition for the pronouns. However, this could easily be modelled in parallel to the interpretation of phi-features as done in Heim and Kratzer (1998,[54]) or Heim (2008,[52]).

Interpretation of Demonstratives

Demonstratives present a direct bridge between the definite article and pronouns. At first glance, their canonical use (cf. Roberts (2002,[93])) seems to be most similar to a deictic use of pronouns (see (46)).

(46)   (*holding up an Adena Indian artefact from 200BC*): This is beautiful craftsman-
ship. (Robert (2002,[93]):92, example (4))

Canonical, deictic uses of a demonstrative have led Kaplan (1989, [63]) to argue that they,
in parallel to his analysis of indexical pronouns, are directly derived from the context[14]:

(47) $[\![this/that]\!]^{g,c} =$ the unique proximal/distant object c_s points at in c at c_t (as re-
ported in e.g. Büring (2012,[14]), see also Roberts (2002,[93]), Elbourne (2008,[31]),
original version in Kaplan (1989, [63]))

This analysis seems plausible insofar as - at least the canonical use - is most often accom-
panied with an actual pointing gesture of the speaker. However, demonstratives can come
with an overt NP argument, similar to the definite article.

(48)   (*policeman, pointing in the direction of a man running through a crowd*) Stop that
man! (Roberts (2002,[93]):92, example (7))

In (48), 'that' is accompanied by an overt NP argument, 'man', but its deictic meaning
component is still present. Other examples demonstrate that demonstratives do not neces-
sarily have to be deictic:

(49)   I saw one quilt which was quite abstract, with lots of asymmetric diagonals. An-
other one was more traditional, worked in an old Amish pattern. This quilt was
less busy than the other, but just as bold. (Robert (2002,[93]):93, example (9))

In contrast to (46) and (48), the demonstrative NP 'this quilt' in (49) does not come with
a pointing gesture in the actual utterance context, but rather seems to be anaphoric to
an element in the previous discourse or text. Thus, similar to deictic uses of third person
pronouns (see the Introduction for those cases), demonstratives can be used deictically, but
not necessarily so. For third person pronouns, I have previously analysed purely discourse
anaphoric and deictic uses uniformly, in accordance to e.g. Heim and Kratzer (1998,[54]).
They are always anaphoric in referring to some salient, previously introduced referent, but
this referent might be linguistically introduced in the discourse or might just be physically

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[14]Again, I will abstract away from Kaplan's original formalization (in parallel to the report of his analysis
of indexicals) and implement a formalization going along Heim and Kratzer (1998,[54]).

present in the actual utterance context, i.e. might be weakly familiar. Roberts (2002) provides additional examples of bound, donkey-style and narrow scope demonstratives (see Roberts (2002,[93]): 93, examples (10) to (14)). These cases suggest that a directly contextual analysis proposed by Kaplan is too strong.

However, the question remains if demonstratives could possibly be analysed in parallel to pronouns, because of their anaphoric nature, or in parallel to the definite article, because of their combination with an overt NP complement. The answer seems to be neither or both. As hinted at above, both components are necessary meaning components of demonstratives. Any analysis has to integrate them rather than exclude one aspect. Roberts (2002,[93]), Elbourne (2008,[31]) and Schwarz (2009,[103]) suggest different but related accounts[15]. Schwarz gives an analysis of the distinction between weak and strong cases of the definite article in German, i.e. he does not directly talk about the English demonstrative, but his analysis in my opinion can be adapted here (see (50) below)[16].

(50)   demonstratives:

```
            DP
          /    \
    proximal    DP
               /  \
              1    DP
                  /  \
                 D    NP
                 |
               this
```
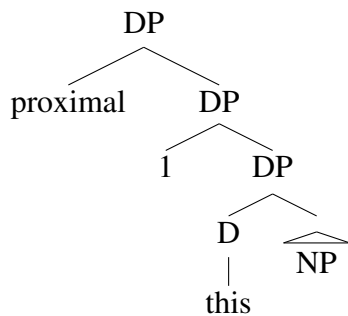
The analysis of demonstratives in (50) integrates several meaning components which have already been relevant above. Importantly, the demonstrative is decomposed into its core lexical meaning in (51), modelled after the German strong definite article, and an index, receiving its interpretation through g (see (50)).

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[15] Roberts (2002,[93]) offers an account in a dynamic semantic system, which I won't adopt in this dissertation. Elbourne (2008,[31]) can be seen in parallel to Schwarz (2009,[103]), where only the formal details of the implementation differs. As in my view, Schwarz (2009,[103]) most directly integrated discourse anaphoricity by way of a variable into a definite-style analysis, this account is closest to a variable-style analysis for pronouns on the one hand and a presuppositional style analysis of the definite article on the other hand, as proposed by the classical view.

[16] Schwarz's analysis will become relevant again when discussing the specifics of the German pronouns and definite article in chapter 3.

(51) $[\![\text{ this }]\!]^{g,c} = \lambda f_{<e,t>}.\lambda y.\iota x[f(x) \& x = y]$ (adapted from Schwarz's (2009,[103]) analysis for the German strong definite article)

This way, the anaphoric nature of demonstratives is captured. With the introduction of the index, uniqueness and (weak) familiarity are established inferentially, as the index necessarily targets a unique and familiar referent. In addition, specific to 'this', I assume the presence of a partial identity function in parallel to pronominal features above which specifies its specific locative relation to the speaker (see (52)). The interpretation of 'this' as used in (46) is given in (53) below:

(52) $[\![proximal]\!] = \lambda x : x$ is proximal to $c_S.x$

(53) a) $[\![this_1]\!]^{g,c} =$
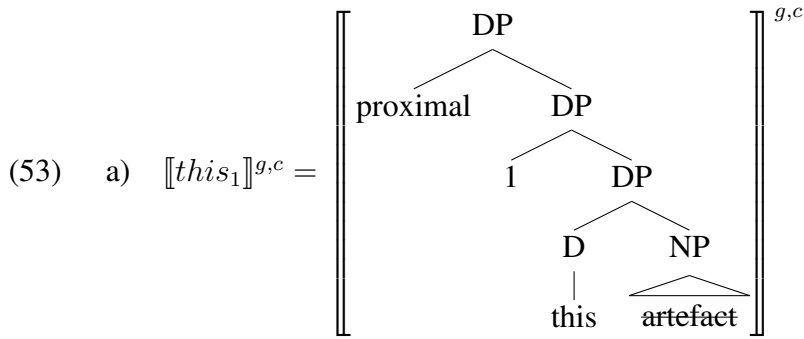
b) $[\![this_1]\!]^{g,c}$ is defined iff $\iota x[x$ is an artefact $\& x = g(1)]$ is proximal to c_S. If so, then $[\![this_1]\!]^{g,c} = \iota x[x$ is an artefact $\& x = g(1)]$

In contrast to the proximal identity function of 'this', 'that' comes with a partial identity function of distance (see (54)); cf. Büring (2012,[14]))[17]:

(54) $[\![distant]\!] = \lambda x : x$ is distant to $c_S.x$

Interim Summary: Classical View

We have seen that in the classical view, all phenomena considered so far sit in the same syntactic position, the D head. However, semantically and pragmatically, different mechanisms are responsible for their interpretation. The variable assignment g links the variables

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[17]Here though, such an analysis with integrating locative relations could be problematic for non-deictically used or bound used demonstratives. As I won't be concerned with these cases, I leave this problem to future research.

to discourse referents in the case of pronouns. The context c with its corresponding parameters is responsible for the specific connection between context and indexical pronouns, by either directly assigning indexicals to contextual parameters (Kaplan (1989,[63]) or as part of the person feature in a Heimian framework (Heim (2008,[52]). For the purposes of this dissertation, I will adopt an analysis for indexical pronouns along the lines of Heim (2008,[52]). The presuppositions of uniqueness and (weak) familiarity are central to the analysis of the definite article and demonstratives, even though uniqueness and familiarity come about through the presence of the index in the case of the demonstrative. Thus, all four phenomena are obligatorily context-dependent, but this dependency is encoded differently each time. Specifically, two main groups of phenomena can be identified: Personal pronouns (including indexical and third person pronouns) and definites (including the definite article and demonstratives), where demonstratives can be seen as a bridge to personal pronouns, as they encode anaphoricity by way of an index.

2.1.2 Uniform View

The basic claim of the uniform view (UV) is that (at least third person) pronouns and the definite article are interpreted in the same way. We will see later how this claim can be directly extended to indexical pronouns. Various researchers have suggested a uniformity approach[18] (e.g. Postal 1966 ([87]), Schwarz (2009,[103])). In this section, I will focus on the analysis as proposed in Elbourne (2013,[32]), as I take it to be the most recent and formally detailed version[19].

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[18]See Keshet (2018,[65] for a uniformity account within a dynamic semantics framework.

[19]Note, though, that I will be free to fit the formalization to the Heim and Kratzer (1998,[54]) framework I have introduced in the Introduction and that I will simplify when I see it fit. Specifically, I will model the formal implementation here according to Grosz and Zobel (2014,[47]), who provide a more simplified analysis. However, this analysis is still close enough to Elbourne (2013,[32]). Elbourne (2005,[30]) also argues for a similar implementation of treating definites and pronouns on a par, but, especially regarding the analysis of pronouns, some changes have been made in Elbourne (2013,[32]) that overcome some of the formal weaknesses of the account in Elbourne (2005,[30]). This is why I will focus on Elbourne's later formal implementation.

Basic Claim of Elbourne (2013)

Elbourne claims that third person pronouns and definites share a semantic and pragmatic analysis. The definite article is analyzed along the same lines as introduced above in the classical view. It sits in the D head, followed by an NP complement and it triggers a presupposition of existence and uniqueness. Here, nothing new is assumed. However, note that Elbourne claims that pronouns receive this same analysis. Third person pronouns are not interpreted as variables, but they are equally functors followed by an NP complement and also trigger a uniqueness presupposition. Different to the analysis for the definite article, the NP argument here is covert and contextually determined (see a slightly simplified version of Elbourne's analysis in (55) below).

(55)   a)   *The cat is sleeping. It ~~eat~~ snores.*

      b)   ⟦ it ~~eat~~ ⟧ is only defined iff $\exists!x[x$ is a cat $\&FAM_w(x)]$. If so, then ⟦ it ~~eat~~ ⟧ $= \iota x[x$ is a cat].

In the following, I want to summarize the core arguments Elbourne makes to support this idea. The main reason Elbourne posits such an analysis is that he wants to achieve uniformity between different uses of pronouns, namely referential, bound and donkey-anaphora uses[20]. To assume uniformity for these cases is attractive from a cross-linguistic perspective, as across languages, the same forms are used for these cases.
We know about referential and bound uses - both have been accounted for in the classical view. But what about donkey-anaphora? See (56) for an illustration.

(56)   Every man who owns a donkey beats it.

At first glance, we might think that (56) is just another case of binding, where 'it' is mapped to the referent in the subject NP. However, 'it' does not refer to the subject, 'every man', but rather to the donkey which has been introduced in the relative clause. Syntacticians have found that binding out of a relative clause is impossible - so how could the donkey bind 'it'? Still, a referential interpretation seems to be equally inappropriate, as here, no particular donkey is meant by 'it', but rather each donkey which is mapped

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[20]He argues that further uses can also be captured by his analysis: descriptive indexicals and 'Voldemort-phrases'. In both cases, it is attractive to assume a deleted NP in the strucutre. Details of these cases can be read up on in Elbourne (2013,[32]): 201-209.

to its owner. Thus, sentences as in (56) have been famously called 'donkey-anaphora', and the pronouns in there 'e-type pronouns'[21]. It has been pointed out that these specific cases where a bound interpretation is desired but syntactically impossible can be easily rephrased with the help of a definite (see (57)).

(57)   Every man who owns a donkey beats *the donkey*.

For Elbourne (2013,[32]), these cases suggest that 'it' in (56) and 'the donkey' in (57) should be treated on a par. How does Elbourne analyze sentences like (56) and (57)? First, a necessary addition in our formal inventory has to be made. Elbourne (2013,[32]) makes use of a situation-based analysis. Very few definites make absolute claims about the uniqueness of its referent. Rather, the referent is most often unique in a particular situation (e.g. there is no one and only table in the world, but in a situation where there is currently only one table present, we can use a definite to make reference to it: 'Put the book on the table!'). Although there are various ways to encode this situational or contextual uniqueness[22], Elbourne makes use of situation semantics to capture this idea and to use it for donkey-anaphora[23]. Here, I will only introduce a rough working definition of situations in order to show how Elbourne captures the meaning of donkey-anaphora, and, as a consequence, of other pronoun uses with the help of situation semantics: 'a situation is part of a possible world' (Elbourne (2013,[32]), following Kratzer (1989,[67]; 2010,[69])).

According to this definition, a situation is part of a possible world and may differ in size, i.e. it might contain only an individual, or several individuals, etc. In terms of its syntactic status, Elbourne (2013,[32]) models situations as pronouns within the syntax of a sentence (Elbourne (2013,[32]): 25). These are differentiated from situation variables occuring in the metalanguage, for example in the denotation of predicates. Predicates receive corresponding situation-encoding lexical entries. Without further explanations, let us consider

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[21]See also Heim and Kratzer (1998,[54]): Chapter 11 and references therein with regard to the origins of this idea.

[22]E.g. von Fintel's Domain Restriction could be applied here: The set of tables is implicitly restricted by only targeting the tables in the particular room. See details for such an analysis in von Fintel (1994,[35]).

[23]Providing a satisfactory overview over situation semantics and the philosophical issues related to it goes beyond the issues raised in this dissertation. The interested reader might begin with Kratzer (2010,[69]) for an overview.

the LF structure of (56) and (57) together, containing situation variables and corresponding binders below[24]. The following LF and corresponding analysis is only loosely based on Elbourne (2013,[32]), but follows Grosz and Zobel (2014,[47]) more closely, as they present a slightly more simplified version of Elbourne's idea (also taking into account a similar framework from Büring (2004,[13])).

(58)
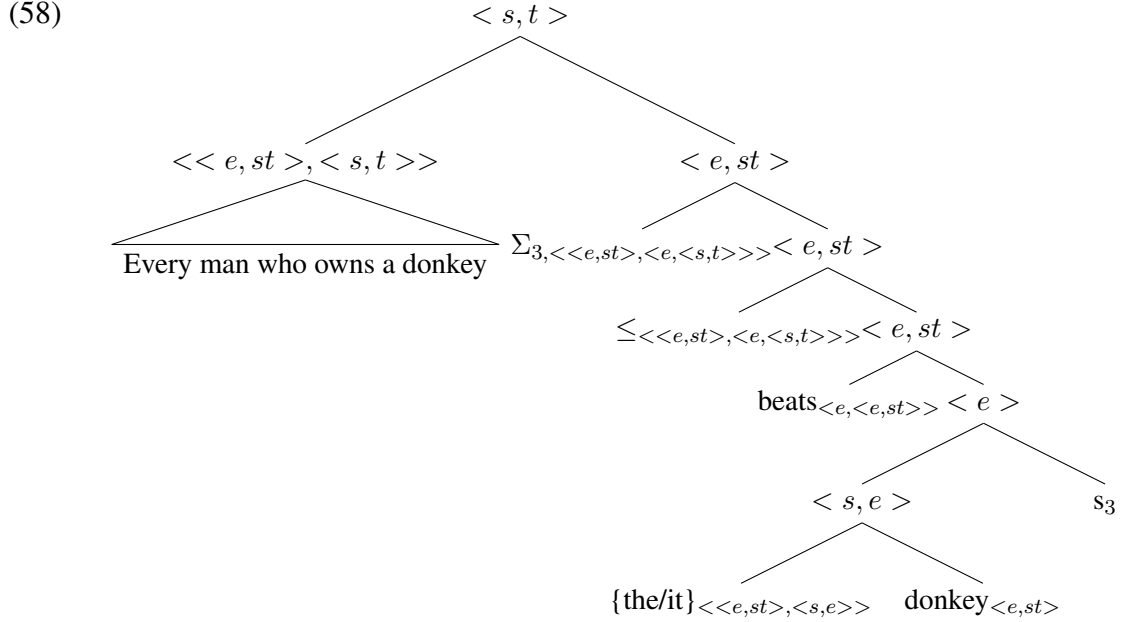
(adapted from Grosz and Zobel (2014,[47]): 5, Session 2 and Elbourne (2013,[32]): 121)

(59) $[\![\leq]\!] = \lambda f_{<e,st>}.\lambda x.\lambda s.\exists s'[s \leq s' \& f(x)(s')]$

(60) $[\![\Sigma_3\ \alpha]\!]^g = \lambda x.\lambda s.[\![\alpha]\!]^{[3\to s]}(x)(s)$

(61) $[\![$ every man who owns a donkey $]\!] = \lambda f_{<e,st>}.\lambda s.\forall x, s'[s' \leq s$ is a minimal situation of x being a man who owns a donkey $\to f(x)(s')]$

(all definitions here are slightly adapted from Grosz and Zobel (2014,[47]); following Elbourne (2013,[32]:34) and Büring (2004,[13]:40))

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[24]This is a simplified version where the internal composition of the subject DP is left aside. As it requires some more semantic gymnastics that relate more to the general implementaion of a situation-based semantics, but less to the point about accounting for donkey-anaphora, I have left the discussion of the DP aside. Details about the internal composition of the DP can be read up in Elbourne (2013,[32]), Chapters 2, 6 and 10.

The LF in (58) contains the quantified DP 'every man who owns a donkey' which as a whole receives the interpretation in (61). Informally, 'every' quantifies not only over individuals, but over individuals that are mapped to individual situations, i.e. in this framework, 'every' rather relates situations where there are men owning donkeys to situations where these respective owner-donkey-pairs are further characterized. This is achieved by a more sophisticated Lambda-Abstraction Operator specific to situation variables, such as defined in (60). With such a more complex binding-rule, the quantified DP can combine with the VP via Function Application. The covert operator '$\leq$' serves to extend the minimal situation of the DP to a bigger situation which includes the VP denotation, i.e. the situations of owner-donkey-pairs are extended such that for those pairs, it holds that the owners beat the donkeys in the extended situations. These components result in the following sentence interpretation.

(62)   a) $\lambda s.\forall x, s'[s' \leq s$ is a minimal situation of x being a man who owns a donkey $\rightarrow \exists s''[s' \leq s''\&x$ beats $\iota z[z$ is a donkey in $s']$ in $s'']]$

     b)   Paraphrase: 'Every minimal situation s' (part of the evaluation situation s) that contains a man x who owns a donkey can be extended into a situation s'' in which x beats the unique donkey in s'.'

     (Grosz and Zobel (2014,[47]):5, Session 2)

Thus, the desired reading where the pronoun 'it' or the definite 'the donkey' is mapped to the donkeys owned in the quantified DP is achieved by binding not the pronoun/definite itself, but the situation pronouns associated with them, without violating the relative clause boundary. This is equally the case for a definite as in (57) and necessarily also for (56), where Elbourne stipulates the NP argument 'donkey' to be phonologically null. Consequently, the analysis of definites (and pronouns) in (38) must be changed so that it is situation-sensitive, as in (63)[25].

(63)   ⟦ the/it ⟧ $= \lambda f_{<e,st>}.\lambda s : \exists!x[f(x)(s) = 1\&FAM_w(x)(s)].\iota x[f(x)(s) = 1]$

Elbourne argues that, because we have to assume this analysis in either case for e-type pronouns in donkey-anaphora, it is desirable to use this same analysis for other pronoun

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[25]Going along with a situation based semantics, also the interpretation of the familiarity presupposition should be situation-sensitive.

uses, such as referential and bound uses, as well. If this is the case, it is desirable to achieve uniformity not only of the different uses of pronouns this way, but also of definites and pronouns more generally. As a consequence, the remaining question is how such an analysis can account for referential and bound uses.

As for bound uses of pronouns as in (24), repeated in (64) below, Elbourne suggests that here, binding also happens via the situation argument of the definite DP 'her mother', being decomposed into 'the mother of the girl in situation s', such that the subject DP situation of 'every girl' is extended to include girl-mother pairs. This situation-binding is achieved with the help of the $\leq$-Operator and the Situation Binder Σ and thus is parallel to the analysis of donkey-anaphora above (see its interpretation in (65)).

(64)   Every girl turns to her mother for advice once in a while.

(65) $\lambda s.\forall x, s'[s' \leq s$ is a minimal situation of x being a girl $\rightarrow \exists s''[s' \leq s''\&x$ turns to $\iota y[y$ is the mother of $\iota z[z$ is a girl in $s']$ in $s'']]$

Donkey-anaphora and bound uses of pronouns are analysed with the help of the same tools, always by binding the situation-argument associated with the pronoun[26] and not through binding of the pronoun itself, as is done in the classical view (see (24) and its corresponding analysis above)). With the analysis of these cases, we can now come back to free, i.e. referential uses of pronouns as captured in (55). We see now that the roughly sketched analysis above directly follows from the analysis of donkey-anaphora and bound uses. Here 'it' is decomposed into 'it cat in situation s', where the NP complement is silent. With a situation-sensitive lexical entry of the pronoun as in (63), following interpretation of the sentence 'It snores' arises[27].

(66) $\lambda s.\iota z[z$ is a cat in $s*$] snores in s.

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[26]It should be noted here that Elbourne (2013,[32]): 209-211 also accounts for sloppy readings in VP-ellipsis. However, the discussion about bound uses of pronouns here and in the classical view should suffice in highlighting the relevant arguments one can draw from these cases. The focus of this dissertation still lies in referential pronoun use. This is why I have also excluded the discussion on pronouns which anaphorically refer to facts or propositions (see Elbourne (2013,[32]): 212 - 223).

[27]Elbourne (2013,[32]) argues that the situation pronoun of a definite is referential, i.e. free, and contains only the unique individual described by the NP. This way, uniqueness is checked against the particular situation s*. If in s*, there is only one unique cat, then the presupposition is satisfied and we can proceed with the sentence interpretation. See, however, Elbourne (2013,[32]): 49ff for details regarding this claim.

Differently from donkey-anaphora and bound uses, the NP complement has to be contextually retrieved from the immediate discourse or from the direct context. This might be more or less straightforward, depending on the context. In (55), the linguistic previous discourse provided the appropriate property, namely being a cat. However, if a pronoun is used deictically, and maybe is accompanied by a pointing gesture, it might not always be very clear which property is to be assigned for the meaning of the pronoun. For example, Elbourne discusses the following case.

(67)   *Situation: "we are walking through Boston and see a smiling young man with a skateboard and a Red Sox cap"* (Elbourne (2013,[32]):198 (see also Elbourne (2005,[30]): 123-4))
         He's happy!
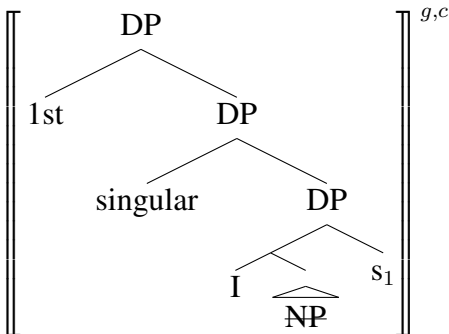
In this situation, it is clear to the conversational participants who is meant. However, finding an appropriate defining NP in this case is hard. Am I talking about young men, or Red Sox's fans or skateboarders? Elbourne argues that even though there is uncertainty about which property is to be retrieved, there is no confusion as to who we are talking about. A possible argument then is that even if one participant takes being a Red Sox fan as the property and another participant takes being a skateboarder, still, both end up with a claim made about the same man. Another way of resolving this complication is to say that the property in these cases is a very general one, like 'man'. However, Elbourne stays ignorant as to which account is more suitable. In the end, some property can be retrieved from the context, be it general or different for different conversational partners.

Summarizing Elbourne's account so far, we can see that he offers uniformity where the classical view has not provided satisfactory alternatives, especially regarding e-type pronouns. Such an analysis further suggests uniformity between pronouns and definites. However, until now, Elbourne does only account for third person pronouns. In Heim (2008,[52]) above, we have seen a unified account of third person and indexical pronouns. The question thus arises if and how Elbourne can provide uniformity for third person and indexical pronouns as well. If this can be done, then indexical pronouns should - under Elbourne's view - be treated as definites as well. We will see in the next section how such an account might look like.

Extension to Indexical Pronouns

One caveat in Elbourne (2013,[32]; 2005,[30]) is that he does not provide an analysis for indexical pronouns as definites in disguise, even though Heim (2008,[52]) has shown that third person and indexical pronouns can be uniformily accounted for. As a reminder, we have seen that indexicals have a special relation to the context - they mark discourse-participants and thus are more intimately connected with the context. Moreover, we have seen that indexicals cannot be bound. The analysis in Heim (2008,[52]) solved this distinction between third and indexical pronouns by including person-features modelled as pre-suppositions where the speaker and addresse are necessarily associated with 1st and 2nd person pronouns, respectively. A resulting possibility of integrating indexical pronouns into an Elbourne-style semantics could lie in adding the same feature-presuppositions to a definite style analysis. This addition is straightforward, as we would have to account for gender features anyways. In an Elbournian analysis, the feature presuppositions, encoded as identity functions, can attach above the definite without having to change their type (see example analyses and derivations below).

(68)   a) $[\![she]\!]^{g,c} =$

b) $[\![she]\!]^{g,c}$ is defined iff $\exists!x[NP(x)(s_1)\&FAM_w(x)(s_1)\&x$ is a female atom excluding c_s and c_A]. If so, $[\![she]\!]^{g,c} = \iota x[NP(x)(s_1)]$.

(69) a) $[\![I]\!]^{g,c} =$

$$
\left[\!\!\left[
\begin{array}{c}
\text{DP} \\
\diagup \qquad \diagdown \\
\text{1st} \qquad\qquad \text{DP} \\
\diagup \quad\quad \diagdown \\
\text{singular} \qquad \text{DP} \\
\diagup \quad \diagdown \\
\text{I} \quad \text{NP} \qquad s_1
\end{array}
\right]\!\!\right]^{g,c}
$$

b) $[\![I]\!]^{g,c}$ is defined iff $\exists! x[NP(x)(s_1)\&FAM_w(x)(s_1)\&x$ is an atom including c_s]. If so, $[\![I]\!]^{g,c} = \iota x[NP(x)(s_1)]$.

For third person pronouns, the combination of features and a definite-style analysis seems quite natural. But in the case of indexicals, it is questionable what the NP property could look like, as the speaker is always referring to herself. However, I have not talked about the interpretation of proper nouns (and I don't want to discuss the interpretation of proper nouns in much detail here - I only suggest one way to interpret them that fits an Elbournian-style analysis of indexicals). In one possible analysis of proper nouns, they are analysed as properties[28].

(70) $[\![Saskia]\!] = \lambda x.\lambda s.x$ is called Saskia in s

In the case of indexicals, the NP property could simply be the identification of the individual by way of her name, as the name of a person serves as maybe the clearest way of identifying someone (see below for such an analysis of 'I'). However, as the NP complement is silent, we can only find most plausible or adequate properties[29].

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[28]cf. Matushansky (2005,[74]) and Elbourne (2005,[30]): chapter 6) for analogous analyses as well as a short discussion in Grosz and Zobel (2014,[47]): Session 2, page 6. For example, they argue that in Austrian German and Modern Greek, an overt definite article is required with proper names.

[29]This analysis of proper names can be used in cases for referential pronouns more generally.
(i) Mary owns a cat. She coddles it. (Grosz and Zobel (2014,[47]): Session 2, page 6, example (23a))
Here, 'she' refers to Mary. With an analysis of proper names as properties, we can straightforwardly analyse 'she' in terms of Elbourne.

(71) a) $[\![I]\!]^{g,c} = $
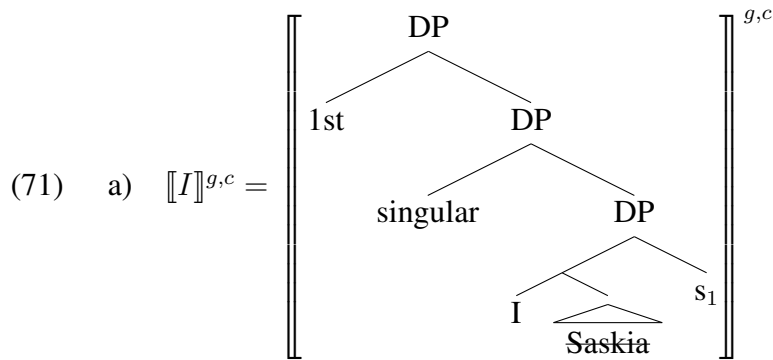
b) $[\![I]\!]^{g,c}$ is defined iff $\exists! x[x$ is called Saskia in $s_1 \& FAM_w(x) \& x$ is an atom including c_s]. If so, $[\![I]\!]^{g,c} = \iota x[x$ is called Saskia in $s_1]$.

With this analysis, the question as how to integrate indexical pronouns in an Elbourne-style analysis might be resolved. We simply add person-feature presuppositions to their analysis. However, cases of 'deferred reference' (Nunberg (1993,[78]); Elbourne (2008,[31])) challenge such a view[30]. In the following, I want to go into detail about these kinds of readings of indexicals[31].

Nunberg (1993,[78]) gives examples where a direct mapping of an indexical pronoun like 'I' to the speaker seems undesireable:

(72) *Condemned Prisoner*: I am traditionally allowed to order whatever I like for my last meal. (Nunberg (1993,[78]): 21, example (32))

(73) *President*: The Founders invested me with sole responsibility for appointing Supreme Court justices. (Nunberg (1993,[78]): 21, example (33))

Instead of a classical indexical interpretation, Nunberg suggests that an adequate reading should be one where the indexical is replaced by a definite description.

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[30]In fact, these cases more generally challenge a variable-style, as well as a contextual parameter-style analysis (see discussion in section 2.1.1). I will stay agnostic as to how the classical view might be able to account for these cases. I only draw on deferred reference to make a point about how a uniform view has to be extended to account for indexical pronouns.

[31]Deferred reference cases are not the only problematic cases for an analysis of indexicals with integrating person-features into a variable or definite approach. Kratzer (2009,[68]) and Heim (2008,[52]) discuss cases of 'fake indexical readings' (originally introduced in Partee (1989,[84])). As 'fake indexicals' require more indepth discussion of the syntax of binding, I won't consider these cases in the following discussion. However, they confirm that problematic cases of indexical use are not marginal phenomena, but occur in different readings, and should thus be taken seriously.

(74) *The condemned prisoner* is traditionally allowed to order whatever *he* likes for *his* last meal. (Nunberg (1993,[78]): 21, example (35))

(75) The Founders invested *the president* with sole responsibility for appointing Supreme Court justices. (Nunberg (1993,[78]): 21, example (36))

Nunberg's paraphrases already suggest that an Elbournian analysis might be able to account for these readings. However, we see that a Heimian person-feature as presuppositions-style extension to an Elbournian definite-analysis is not able to capture these readings. The presuppositions of 1st person would require the indexical to be mapped to only one single person, namely the actual speaker of the utterance (see as a reminder the definedness-conditions of 'I' in (71b)). However, even though the actual speaker bears the property in question (for (72) to work, the speaker has to actually be a condemned prisoner), the readings here rather target anyone who might equally be a prisoner (or president, respectively). Thus, a person-feature presuppositional analysis is too narrow for these cases. Nunberg (1993,[78]) suggests that all types of indexical expressions should receive a more complex analysis, consisting of three meaning components:

(76) • deictic component: picks out the actual object within the context, i.e. the 'index'

   • relational component: defines the relation between the index and the interpretation

   • classificatory component: further information about the interpretation, e.g. ϕ-features.

   (cf. Nunberg (1993,[78]))

In the case of (72), the index for 'I' would refer to our previously introduced contextual parameter c_S, the relational component would include the property of being a condemned prisoner, which holds likewise for the speaker, and the classificatory information would include for example the number-feature. But how can we formally capture this account? Nunberg himself does not provide a formal analysis, but Elbourne (2008,[31]) in fact does[32]. He straightforwardly integrates the deictic and relational component into

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[32]Elbourne (2008,[31]) takes cases of descriptive indexicals as a case in point for analysing all pronouns

the syntax: Here, the meaning of the indexical stays identical to that of the definite article given in (63). However, its complement is more complex. It is composed of a relation and an index, in direct correspondence to Nunberg (see the internal syntax of 'I' in (77) below). Both, Elbourne argues, receive their meaning from the context. The meaning of 'I' in (72) is thus composed of the meaning of the index, as captured in (78), and that of the relation as in (79). They combine via Function Application, so that the argument for the indexical is of type $< e, st >$ as usual. The overall interpretation of 'I' (72) is given in (80) below. It indeed is able to capture the deferred reference meaning, where 'I' does not only target the actual speaker, but rather individuals that share the relevant property with the speaker.

(77)
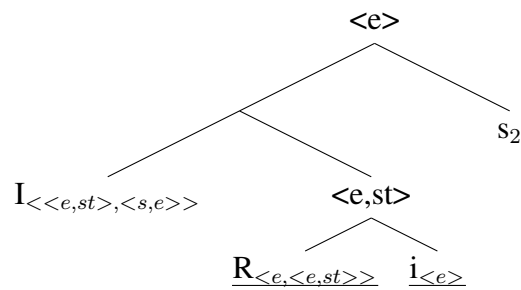
(78) $[\![i]\!]^{g,c} = c_s$

(79) $[\![R_7]\!]^{g,c} = g(7) = \lambda x.\lambda y.\lambda s.y$ has the property of being a condemned prisoner in s that x has in s^*. (see Grosz and Zobel (2014,[47]: Session 2, page 7, example (27)) and Elbourne (2008,[31]: 422))

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in a Nunberg-style way. However, in Elbourne (2013,[32]), he backs away from this analysis, saying that all 3rd person pronouns receive the analysis introduced above and that only possibly indexicals receive a more complex interpretation, see pages 201 - 205 in Elbourne (2013,[32]) for further discussion. In other words, Elbourne (2008,[31]) does not directly account for indexical pronouns, but for deictically used 3rd person pronouns. However, as Nunberg (1993,[78]) in fact wants to give an account of indexicals, I introduce Elbourne's (2008,[31]) formalization to capture the interpretation of indexicals, even though this is not done in Elbourne. This extension is also argued for in Grosz and Zobel (2014,[47]).

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(80) a) $[\![I]\!]^{g,c} =$

$$\left[\!\!\left[\begin{array}{c} \text{<e>} \\ \diagup \qquad \diagdown \\ \diagup \qquad \qquad s_2 \\ I_{<<e,st>,<s,e>>} \qquad \text{<e,st>} \\ \diagup \quad \diagdown \\ R_{7,<e,<e,st>>} \quad i_{<e>} \end{array} \right]\!\!\right]^{g,c}$$
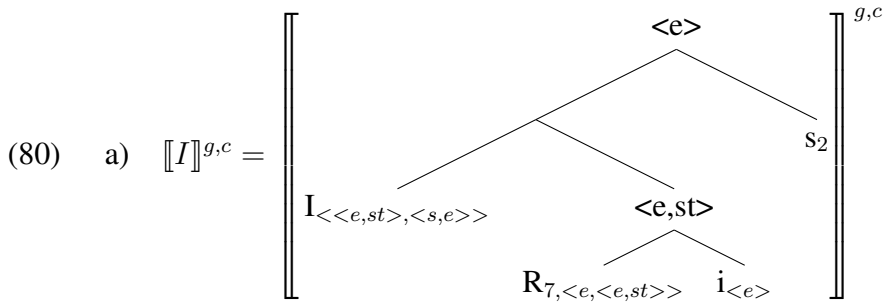
    b) $[\![I]\!]^{g,c}$ is defined iff $\exists!x[x$ has the property of being a condemned prisoner in s_2 that c_S has in $s*$. If so, then $[\![I]\!]^{g,c} = \iota x[x$ has the property of being a condemned prisoner in s_2 that c_S has in $s*]$.

What about our standard cases of indexicals, where they in fact do refer to the speaker, and noone else? Elbourne (2008,[31]) argues that in these cases, R can be defined as an identity relation (see (82) below for a definition). He further posits that "wishing to talk about the actual index is so universal and natural that the relation of identity is generally salient in such cases." (423). The interpretation of 'I' as used in (81) is given in (83) below.

(81)   I am German.

(82) $[\![R_i]\!]^{g,c} = g(i) = \lambda x.\lambda y.\lambda s.y = \text{x in s}$

(83) a) $[\![I]\!]^{g,c} =$

$$\left[\!\!\left[\begin{array}{c} \text{<e>} \\ \diagup \qquad \diagdown \\ \diagup \qquad \qquad s_2 \\ I_{<<e,st>,<s,e>>} \qquad \text{<e,st>} \\ \diagup \quad \diagdown \\ R_{i,<e,<e,st>>} \quad i_{<e>} \end{array} \right]\!\!\right]^{g,c}$$
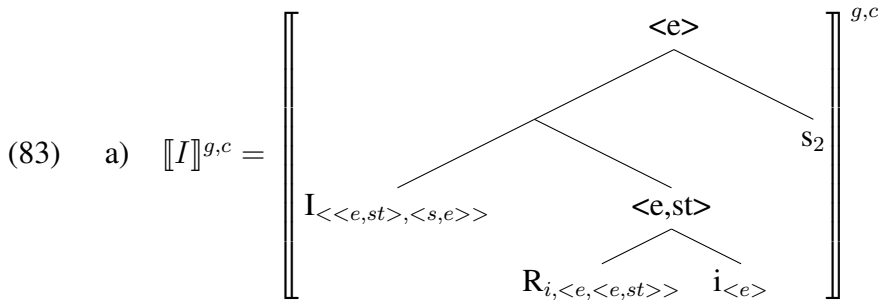
    b) $[\![I]\!]^{g,c}$ is defined iff $\exists!x[x$ in $s_2 = c_S$ in $s*]$. If so, $[\![I]\!]^{g,c} = \iota x[x$ in $s_2 = c_S$ in $s*]$.

To summarize, I have shown how an Elbournian-style analysis of third person pronouns and definites can be extended to indexical pronouns. Here, the analysis of the indexical follows from decomposing it into a definite operator, which is the same as in the case of definites and third person pronouns. However, its argument is more complex and is composed of a contextually given relation and an index. In standard uses of indexicals, the

relation will be the identity relation. However, the system allows for non-identical relations which are captured in deferred reference cases. Consequently, the analysis of third person pronouns, definites and indexical pronouns is systematically related, while the analysis of indexicals includes their close connection to the immediate utterance context with the help of the syntactically encoded index. This syntactic difference is different from how Heim (2008,[52]) accounts for the uniformity of pronouns, where person-features derive the specific connection to context in the case of indexicals.

Extension to Demonstratives

The analysis for demonstratives proposed in light of the classical view (adapted to fit a situation-sensitive interpretation, see (84) below) in section 2.1.1 on page 32 is compatible with an Elbourne-style analysis of pronouns and the definite article. An additional advantage of the present view is that here, we assume the presence of an optionally phonologically silent NP argument anyways, so it is not surprising that demonstratives can be used on the one hand pronominally and on the other hand with an overt NP argument.

(84) $[\![$ this $]\!]^{g,c} = \lambda f_{<e,st>}.\lambda y.\lambda s.\iota x[f(x)(s)\& x = y$ in $s]$ (adapted from Schwarz's (2009,[103]) analysis for the German strong definite article)

Interim Summary: Uniform View

In the uniform view, the interpretation of the four relevant constructions (third person pronouns, indexicals, the definite article and demonstratives) is parallel. Syntactically, all are D-heads with complements, and semantically, all are functors of type $<< e, st >, e >$ which trigger a uniqueness presupposition, but the status of the complements differ. In the case of third person pronouns, the NP complement is covert, while in the case of indexical pronouns, the complement is complex. In the case of demonstratives, there is an additional syntactic layer indicating the strong connection to the context.

2.1.3 Refinement: Considering Salience

In the preceding sections, we have seen how a thorough analysis of the definite article,demonstratives, third person and indexical pronouns looks like under the uniform and

classical view. Especially regarding the requirements that have to be met by the context, the definite article has been associated with uniqueness and familiarity under both views. Pronouns under a uniform view have also been associated with uniqueness and familiarity, whereas in the classical view, the appropriateness condition captures that there be an appropriate referent in the context. The uniform view has thus given the definite article and pronouns an identical analysis which until now extends to the pragmatic meaning components. However, the question immediately arises why two morphologically distinct phenomena come with the same meaning. Moreover, we might ask how a language learner might understand that the morphologically distinct phenomena are interpreted in parallel. This problem extends to the classical view. Even though there is a distinction between definites and pronouns, it might not be enough to capture the connection of pronouns and the context with the help of the appropriateness condition alone. These shortcomings of both the uniform and classical view regarding the pragmatic aspects of the meaning of pronouns and definites need to be fixed. In the following, I will introduce a necessary additional refinement, where a more fine-grained distinction of the contextual requirements associated with definites and pronouns is introduced by the additional requirement of **salience**. Salience is only an obligatory requirement for pronouns, not for definites (following Roberts (2003,[94])). This distinction will be implemented in both a uniform and classical view. Taking into account this refinement will give us the final version of a target grammar assumed throughout this dissertation.

Roberts (2003, [94]) takes examples originally discussed in Heim (1982,[51]) to illustrate that pronouns and definites are not always equally appropriate in certain contexts. Instead, pronouns necessarily target salient referents, whereas definites target unique and familiar referents.

(85)   I dropped ten marbles and found all of them, except for one.

    a)   It is probably under the sofa.

    b)   {$^{\#}$The marble/ the missing marble} is probably under the sofa.

(86)   I dropped ten marbles and found only nine of them.

    a) $^{??}$It is probably under the sofa.

b) {#The marble/ the missing marble} is probably under the sofa.

(examples adapted from Roberts 2003: 335)

(87) A woman entered from stage left. Another woman entered from stage right.

a) {#The woman / The FIRST woman / The SECOND woman} was carrying a basket of flowers.

b) She was carrying a basket of flowers, while {#the woman/ the FIRST woman/ #the SECOND woman} led a goat.

(examples from Roberts 2003: 324)

In (85), the missing marble is made sufficiently salient, so that referring to it with the pronoun 'it' is natural, even though there are more marbles in the context - so uniqueness is not given. Consequently, using an underspecified definite DP 'the marble' violates uniqueness. In contrast, in (86), the missing marble is not sufficiently salient, so that using 'it' to refer to it seems inappropriate, while still using an underspecified definite DP is equally inappropriate as in (85). The only change between (85) and (86) was to explicitly mention the missing marble in the one case while not mentioning it at all in the other.

Example (87) highlights a similar point. The pronoun 'she' in (87b) can only refer to the lastly introduced woman, so the more salient one, while uniqueness is also not given. This becomes evident by looking at the continuations of the sentence. Using an underspecified DP 'the woman' is still inappropriate, because the definite article cannot access the more salient one.

Roberts (2003) takes these examples as a case in point that the definite article is not (necessarily) sensitive to salient discourse referents, but that third person pronouns are - and that they do not require a unique referent. However, what is it exactly that we are observing in these examples? Or, in other words, how can salience be defined? Roberts (2003) gives the following definition:

(88) Salient discourse referents:

- must be (weakly) familiar.

- pertain to a current goal in the hierarchical structure of discourse goals (question under discussion) and domain goals of the interlocutors.

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- are partially ordered for relative salience. In certain cases, we can determine that two salient discourse referents i and j are asymmetrically ordered, $i >_{Salient} j$, if one or more of the following holds:

  - i is strongly familiar and j is only weakly familiar, unless j is brought to the attention of the interlocutors in some other way
  - i pertains to goal g_i, j pertains to goal g_j, and g_i is a more immediate goal (or question under discussion) than g_j.
  - i and j correspond to NPs which occur in the same sentence, pertaining to the immediate question under discussion, and i is more highly ranked than j using Centering principles (e.g., taking into account grammatical relations, topic/focushood, relative surface order, etc.)

(Roberts (2003,[94]): 334, example (55))

As the definition in (88) illustrates, salience is defined as an ordering, where the most salient referent is picked out by the pronoun. This ordering is established through familiarity, contribution to more or less immediate discourse goals and further aspects identified by the 'Centering Theory' (cf. Grosz et al (1995,[46])). Regarding the latter point, the 'Centering Theory' from computational linguistics very roughly states that the resolution of pronouns is dependent on finding the center of attention, as e.g. established through grammatical roles (such as subjecthood) and discourse roles (such as contributing to the plans and intentions of the conversational participants) in the previous discourse and it is a direct answer to evidence from computational linguistics supporting such a view (see e.g. Grosz (1977,[45]))[33]. Empirical investigations using corpus studies but also psycholinguistic tools bring further evidence for the centering approach to pronoun resolution (see e.g. Hudson-D'Zmura (1988,[59]), Hudson-D'Zmura and Tanenhaus (1998,[60]) and Ariel (1988,[2]) and a discussion of these studies in Roberts (2003,[94])).

However, the examples in (85) to (87) allow an alternative explanation. Instead of the referent being 'salient' per se in the context, maybe pronouns target the most local refer-

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[33]The definition of salience of Roberts (2003,[94]), in (88), sufficiently introduces the most relevant aspects of this theory, as adapted to fit sematic frameworks in Roberts (1998,[92]). I won't go into detail of the Centering Theory itself, more can be learned from the references given above.

ent[34]. In (87), for example, the pronoun 'she' targeted the referent introduced closest to the use of a pronoun. Equally in (85), the missing marble is identified in the immediately preceding sentence. So do pronouns refer to the most immediate, i.e. most local referent, instead of the most salient one? Roberts (2003,[94]) cites an example in Grosz (1977,[45]) to show that this is not the case:

(89)   A: One bolt is stuck. I'm trying to use both the pliers and the wrench to get it unstuck, but haven't had much luck.
       B: Don't use pliers. Show me what you're doing.
       A: I'm pointing at the bolts.
       B: Show me the 1/2" combination wrench, please.
       A: OK.
       B: Good, now show me the 1/2" box wrench.
       A: I already got it loosened.
       (Roberts (2003,[94]): 332, example (52))

In the example above, A using 'it' in the last line does not refer to the immediately preceding referent, which would be the 1/2" box wrench, but it refers to the stuck bolt A talks about at the beginning. Consequently, in cases where the topic of the conversation (or, speaking in terms of Roberts (2003,[94]), the question under discussion or the goals of a conversation) stays the same across several utterances, the salient referent does not have to be the most immediately talked about referent.

Yet another argument by Roberts (2003,[94]) against pure locality are cases where two potential antecedents occur in the same, immediately preceding sentence:

(90)   If a man lives with another man, he shares the housework with him. (Roberts (2003,[94]): 333, example (53))

Locality cannot help us in distinguishing between the two referents in the antecedent clause. However, salience as defined within a Centering framework does indeed provide a distinction. In terms of Centering, subjects are generally more salient than objects. Thus, 'he' preferrably refers to the first man. 'Him' then, due to syntactic constraints, cannot

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[34]See a short overview over a definition of salience where it is treated as tackling the most local referent in Büring (2012,[14]).

refer to the subject, as binding principles would be violated. Instead, 'him' takes the only other available discourse referent, namely the object.

A third argument against locality comes from narrative texts. In novels, pronouns can refer to the protagonist, even if it is not the protagonist who has been named in the immediately preceding paragraph. A very extreme case of these pronoun uses can be found in the novel 'Wolf Hall' by Hilary Mantel (2009,[73]), where throughout the novel, the pronoun 'he' refers to the protagonist, even if he hasn't been present in the preceding paragraphs[35].

(91)   "Morgan takes out his purse. He puts down coins: chink, chink, chink, with enticing slowness. He touches his cheeckbone. It is bruised, intact: but so cold." (Mantel 2009,[73]: p. 11)

In the passage in (91), 'he' in the second sentence clearly refers to Morgan, as he is the locally most recent antecedent. However, 'he' in the third sentence can only refer to the protagonist, Cromwell. In the preceding situation, Cromwell was beaten up by his father, and so the bruises on the cheeckbone can only describe Cromwell. Morgan is not hurt and so can not be the intended referent here. Consequently, Cromwell can be chosen as the referent, as he as protagonist is salient, while not being the locally most immediate referent.

Roberts (2003,[94]) suggests to treat salience as an alternative presupposition to uniqueness: the existence of an appropriate referent has to be guaranteed by the context. If a pronoun is used and there is no salient referent, the sentence containing the pronoun is not false, but it is undefined. Also, the requirement of salience stays constant across different sentence types (such as negation or questions). Such a definition of the salience presupposition should infer uniqueness, as the most salient referent is constituted as being unique by virtue of it being the only most salient referent. For the classical view, the salience presupposition can be modelled as an identity function in parallel to the ϕ-features of pronouns, as illustrated below: (92) represents the interal, decomposed LF structure of a pronoun, (93) captures the definition of the salience-presupposition as a feature and (94) defines the ordering of maximal salience required within the interpretation of the salience-

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[35]Literary texts more generally provide valuable additonal insights about how the context provides a referent and what happens if there is none. See Bade and Beck (2017,[5]), Bauer et al. (2009,[7]), Bauer et al. (2015,[6]) for more thorough discussion of such cases.

feature. (95) illustrates the interpretation of a pronoun, disregarding the additional features for now.

(92)

$$
\begin{array}{c}
\text{DP} \\
\diagup\ \ \diagdown \\
\text{SAL}_{<e,e>} \qquad \text{DP} \\
| \\
it_{i,<e>}
\end{array}
$$
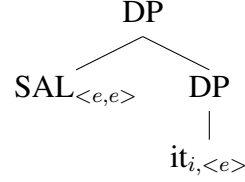
(93) $[\![SAL]\!] = \lambda x : \forall y[y \text{ is salient in s} \to y \leq_{SAL} x].x$

(94) The ordering $\leq_{SAL}$: For all a, b that are discourse referents in c: $a \leq_{SAL} b$ if (a) b is strongly familiar and a is weakly familiar, (b) b pertains to a more immediate Question under Discussion (QUD) than a, (c) b is more prominent than a regarding grammatical relations such as topic/focushood etc.
(adapted from [94]: 330, example (49) and 334, example (55))

(95) a) $[\![it_i]\!]^{g,c} = \left[\!\!\left[\begin{array}{c} \text{DP} \\ \diagup\ \ \diagdown \\ \text{SAL}_{<e,e>} \qquad \text{DP} \\ | \\ it_{i,<e>} \end{array} \right]\!\!\right]^{g,c}$

  b) $[\![it_i]\!]^{g,c}$ is defined iff $\forall y[y \text{ is salient in s} \to y \leq_{SAL} g(i)]$. If so, then $[\![it_i]\!]^{g,c} = g(i)$

However, if we take Robert's (2003,[94]) claim seriously that the salience presupposition takes the place of the uniqueness presupposition inscribed into the lexical entry, no uniformity and no compositional parallelity is given anymore between pronouns and definites under a uniform view. To illustrate, consider the lexical entries of the definite article in (96) below and the alternative lexical entry of pronouns in (97)[36]:

(96) $[\![the]\!]^{g,c} = \lambda f_{<e,st>}.\lambda s : \exists! x[f(x)(s) = 1 \& FAM_s(x)].\iota x[f(x)(s) = 1]$

(97) $[\![it/he/she]\!]^{g,c} = \lambda f_{<e,t>}.\lambda s : \exists x[f(x)(s) = 1 \& FAM_s(x) \text{ SALIENT }(x)(s) \& \forall y[\text{ SALIENT }(y)(s) \to y \leq_{SAL} x]].\iota x[f(x)(s) = 1]$

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[36]Note that familiarity is established as a presupposition in the interpretation of pronouns in the uniform view, but follows from the 'appropriateness-condition' in the case of the classical view (see (19)).

Even though both definitions capture Robert's (2003,[94]) insight about inferential unique-ness in the case of pronouns, the caveat is that except for syntactic uniformity, the semantic-pragmatic composition of definites and pronouns is not uniform anymore. This is prob-lematic for the uniform view.

To achieve uniformity by still integrating the salience-presupposition into the interpreta-tion of pronouns while leaving the lexical entry of the pronoun itself equivalent to that of the definite article in (96), I propose a new formal solution. On the one hand, I will make use of the salience-feature as defined above for the classical view. The goal is to be able to integrate it in parallel as has been done for phi-features and to leave it as an identity function. However, simply by stacking this salience feature on top of the usual interpre-tation of a definite or pronoun, as structurally given in (98) does not solve the problem of inferential uniqueness.

(98)
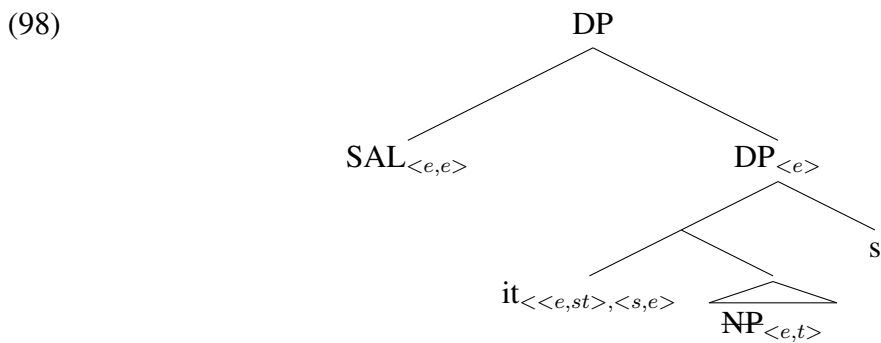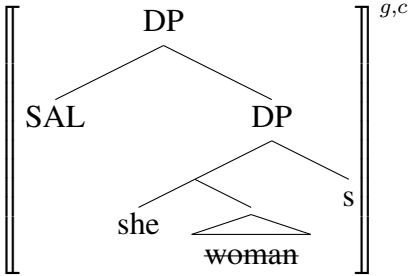
Remember that in example (87) above on page 48 (and repeated below in (99), the pronoun 'she' can be used felicitously to refer to the lastly introduced woman, while using a definite is not felicitous.

(99) A woman entered from stage left. Another woman entered from stage right.

   a) {#The woman / The FIRST woman / The SECOND woman} was carrying a basket of flowers.

   b) She was carrying a basket of flowers, while {#the woman/ the FIRST woman/ #the SECOND woman} led a goat.

   (examples from Roberts 2003: 324)

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In other words, if we leave the lexical entry of definites and pronouns as in (96), we would still presuppose that there be a unique woman in the context which, additionally, should be maximally salient, as is illustrated by such an interpretation of the pronoun 'she' from example (99) in (100). The definedness conditions in (100b) demonstrate that we would run into problems, as uniqueness is only targetting the NP complement, and thus we would arrive at a presupposition failure under such an analysis.

(100)   a) $[\![she]\!]^{g,c} =$

$$\left[\!\!\left[\begin{array}{c} \text{DP} \\ \diagup \quad \diagdown \\ \text{SAL} \qquad \text{DP} \\ \diagup \diagdown \\ \text{she} \quad \underset{\text{woman}}{\triangle} \quad \text{s} \end{array}\right]\!\!\right]^{g,c}$$

   b) $[\![she]\!]^{g,c}$ is defined iff $\exists! x[x$ is a woman in $s]\,\&\,\forall y[y$ is salient in s $\rightarrow y \leq_{SAL} \iota x[x$ is a woman in $s]]$. If so, then $[\![she]\!]^{g,c} = \iota x[x$ is a woman in $s]$.

In order to solve this problem, the property the pronoun takes as argument has to be further restricted. Only then can the maximally salient referent be picked out from this further restricted set and uniqueness is not violated. Context restriction of definites has been proposed previously by von Fintel (1994,[35]) on independent grounds. Regarding quantifiers as 'every' or the definite article below, von Fintel (1994,[35]) observed that only contextual uniqueness is given and not universal uniqueness. In other words, all students in a particular setting passed, not all students of the world. This is why he proposes to enrich the LF structure of quantifiers and definites with a covert variable C (see (103) and (104) below) and to modify the lexical entry of the definite article accordingly (see (105) below).

(101)   Every student passed.

(102)   The book is on the table.

(103)

$$\begin{array}{c} \text{DP} \\ \diagup \quad \diagdown \\ \diagup \quad \quad \text{NP} \\ \text{every} \quad C_8 \quad \underset{\text{book}}{\triangle} \end{array}$$

(104)

```
                    DP
               ┌─────┴─────┐
          ┌────┴────┐     NP
         the   C_7     ┌──┴──┐
                         book
```
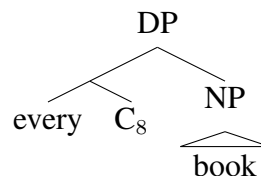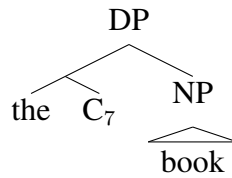
(105) $[\![the_C]\!]^{g,c} = \lambda f_{<e,t>} : \exists!x[f(x) = 1 \& g(C)(x) = 1].\iota x[f(x) = 1 \& g(C)(x) = 1].$

However, the notion of context restriction by way of a covert variable is not yet helpful for this particular problem yet because of two reasons: Elbourne's (2013,[32]) analysis of the definite article makes use of situation semantics. As in this framework, uniqueness is only given in a particular situation, we don't need context restriction per se. Secondly, examples such as (99) can't be accounted for by either situation-semantics or contextual restriction alone. Under the uniform view, both the definite article and pronouns would receive a situation-sensitive or contextually restricted interpretation. However, while it is intuitively true that the set of available referents in the case of pronouns seems to be further restricted, this is not possible for the definite: it is infelicitous to use the bare definite article in order to refer to the most previously introduced woman, although the technicalities would make such an utterance possible. As a consequence, the desired outcome can only be achieved by integrating both the situation-sensitive interpretation we have assumed under the uniform view and an additional covert restriction specific to pronouns. I will call this restriction 'C_{SAL}'. As is illustrated in (106), this covert variable restricts the set of referents to those that are salient in the situation. The modified uniform lexical entry of the definite article and pronouns is sensitive to contextual restriction (see (107)). Compositionally, 'C_{SAL}' will be selecetd as the covert restriction in the case of pronouns. As we can see in the decomposed LF structure in (108), the salience feature, which is responsible for evoking an ordering of all salient referents and picking out the maximally salient one, is stacked on top of the pronoun, as suggested above, only that now, the covert variable 'C_{SAL}' further restricts the set of referents in order to prevent a presupposition failure of uniqueness.

(106) $[\![C_{SAL}]\!]^{g,c} = \lambda x.\lambda s.x$ is salient in s

(107) $[\![\text{ the/it/she }]\!] = \lambda C_{<e,st>}.\lambda f_{<e,st>}.\lambda s : \exists!x[f(x)(s) \& g(C)(x)(s)].\iota x[f(x)(s) \& g(C)(x)(s)]$

(108) LF:

$$DP_e$$

$$SAL_{<e,e>} \quad DP_e$$

$$s$$

$$NP_{<e,st>}$$

$$she_{<<e,st>,<<e,st>,<s,e>>} \quad C_{SAL,<e,st>} \quad \text{w̶o̶m̶a̶n̶}$$

(109)

$$\left[\!\!\left[\begin{array}{c} DP \\ SAL \\ \text{she} \quad C_{SAL} \quad NP_{<e,st>} \\ \text{w̶o̶m̶a̶n̶} \end{array} s \right]\!\!\right] \text{ is defined iff:}$$
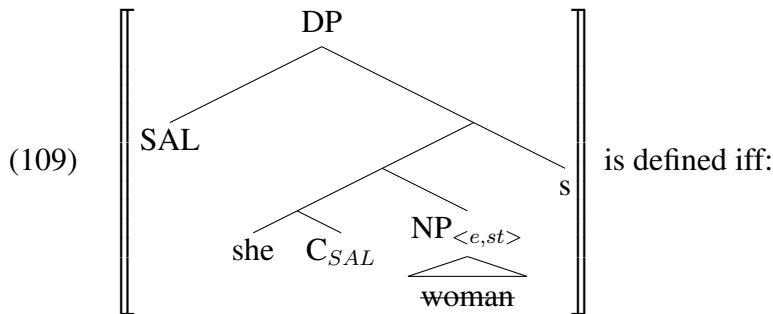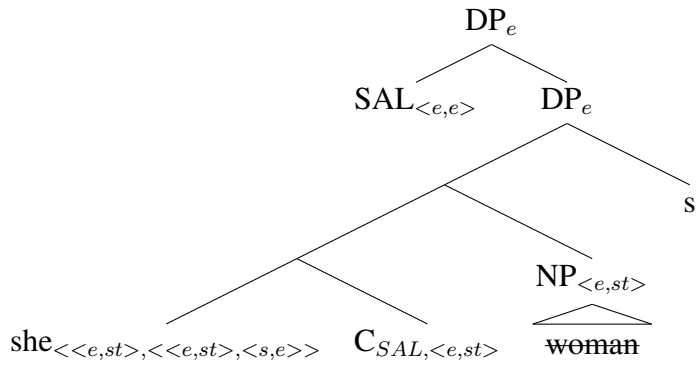
$$\exists! x[x \text{ is salient in } s \ \& \ x \text{ is a woman in } s]$$

$$\& \quad \forall y[y \text{ is salient in } s \to y \leq_{SAL} x]$$

If so, then:

$$\left[\!\!\left[\begin{array}{c} DP \\ SAL \\ \text{she} \quad C_{SAL} \quad NP_{<e,st>} \\ \text{w̶o̶m̶a̶n̶} \end{array} s \right]\!\!\right] = \iota x[x \text{ is salient in } s \ \& \ x \text{ is a woman in } s]$$
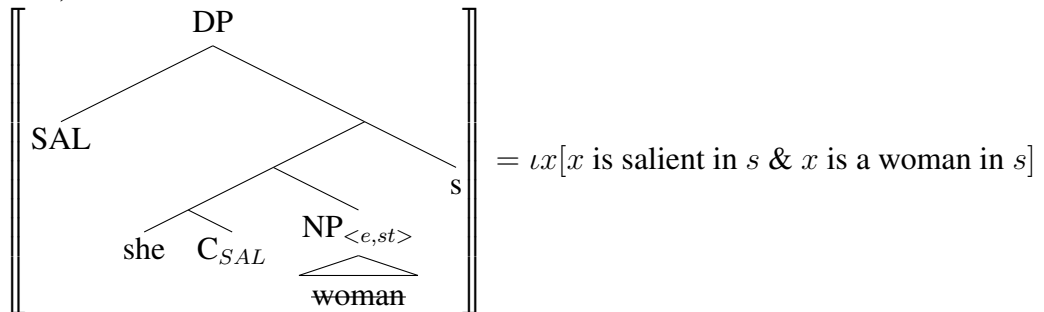
The interpretation of 'she' then is given in (109) and provides the desired outcome: there is no presupposition failure, as the covert salience-restriction makes sure that the uniqueness presupposition of the pronoun only tackles a subset of available referents, namely the salient ones. The salience-feature then makes sure that this referent be not only salient, but be the maximally salient one.

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To summarize, we see that salience can be modelled as a feature that functions in parallel to the ϕ-features of pronouns. While such a feature approach to salience works well under the classical view, the formal analysis of definites and pronouns has to be further modified under the uniform view in order to preserve a uniform analysis of definites and pronouns. Even though more can be said about the nature and definition of salience, I will take the above definitions and the formal definition of the salience presupposition as a feature in (93) as sufficient for the empirical analyses in chapters 3 and 4 and for the identification of the pathway in language acquisition to the target grammar in the second part of this chapter.

2.1.4   Interim Summary: A Target Grammar

Tables 2.1 and 2.2 summarize the analyses for definites and pronouns put forward by the uniform and classical view. Table 2.1 focuses on the compositional analysis of the constructions. Definites, in both views, are interpreted as functors with an overt NP complement and an additional DP layer introducing an index in the case of the demonstrative (see lexical entries in (38b) and (51)). The main difference between the two views lies in the analysis of pronouns. In the uniform view, they are analysed as functors (see (63) and (77)), while in the classical view (and following a feature-driven analysis of indexicals as proposed in Heim (2008,[52])), pronouns carry indices that are interpreted as variables (see (35) to (37)).

		Uniform View	Classical View
Definites	Definite Article	functor with an overt NP argument	
	Demonstratives	functor with an overt NP argument and a contextually given index as second argument	
Pronouns	Third Person	functor with a covert NP argument	variable
	Indexicals	functor with complex argument: relation combined with an index	variable

Table 2.1: Compositional Analysis

Table 2.2 focuses on the contextual requirements that come with the use of definites and

pronouns. All these requirements have been analysed as presuppositions. As we have seen in the preceding section, both the uniform and the classical view are in need of further refinements in this regard. Not only uniqueness and (weak) familiarity are necessary prerequisites, but pronouns come with the additional requirement of salience. Additionally, demonstratives have been attributed requirements of location, i.e. the relative location of the intended referent has to be close to the speaker for 'this' and further away for 'that' (see (54) and (52)) and pronouns have been attributed phi-features (see (35) to (37) and the discussion of phi-features in a uniform view approach in (68)). Regarding the analysis of indexical pronouns, the only difference between the uniform and classical view for the pragmatic meaning component arises. In the uniform view, indexicals are interpreted as functors with a complex argument. The index contained in the argument guarantees the indexical nature - no number feature is needed here. In the classical view, indexicals are variables that are necessarily associated with number features.

		Uniqueness	Familiarity	Location	Salience	Φ-Features
Definites	Definite Article	✓	✓	-	-	-
	Demonstratives	✓	✓	✓	-	-
Pronouns	Third Person	-	✓	-	✓	✓
	Indexicals	-	✓	-	✓	✓ (CV)/ -(UV)

Table 2.2: Pragmatic Analysis: Presuppositions

Tables 2.1 and 2.2 give an overview over how a uniform or classical target grammar looks like. Now, the question remains how a language learner might be able to acquire such a grammar.

2.2 The Pathway to the Target Grammar

In the previous section (2.1), I have given an overview over how different approaches define the target grammar of English learning children. The uniform view models the compositional analysis of definites and pronouns in parallel, whereas the classical view does not. This section is concerned with the learner's task of acquiring a target grammar.

This task can be managed in two different ways, corresponding to the uniform or classical view. For both views, there are necessary prerequisites that a child has to acquire regardless of the specific theoretical predictions. Consequently, I will give an overview over all aspects that are involved in helping the child figuring out the target grammar, given the often unrepresentative and underspecified input.

In Section 2.2.1, I will start out in sketching which more general prerequisites are necessary before children can even start figuring out what pronouns and definites mean. Then, in Section 2.2.2, I will go on and introduce the learner's task going from the starting point of what the input provides as information. The input, together with the specific properties of each theoretical approach, will give a picture of the difficulty of learning pronouns and the definite article. On the basis of these two sections, I will introduce two possible pathways in Section 2.2.3, one according to a uniform grammar, the other according to a classical grammar. Once these pathways have been shaped, I will go on with introducing key studies on the acquisition of the two phenomena which are most relevant for this research endeavor and discuss them in light of the learner's task and the pathways identifed (see Section 2.2.4). Lastly, I will provide specific research questions which will guide the empirical part of this dissertation (see Section 2.3).

2.2.1 Prerequisites for the Acquisition of Pronouns and Definites

At which point in children's language development can they possibly start understanding and using pronouns and definites? First, several rather basic abilities have to have been already developed. Perceptual abilities to fixate different objects in the surroundings of the child, conceptual abilities of being able to map referents within the situational context to the linguistic signal, socio-pragmatic abilities of being sensitive to information provided in the ongoing discourse and being able to jointly focus on objects in the situation or discourse and parsing and interpretation abilities, i.e. having knowledge about basic syntax and compositionality.

The overviews of language development in general terms in for example Fisher and Gleitman (2002,[37]), Szagun (2013,[114]), Clark (2016, [22]), Tomasello (2003,[115]) serve as a good starting point for finding this point in time when children have mastered all these necessary abilities. So when is this? Babies are confronted with a speech stream from the

moment they are born. With the help of distributional, rhythmic and phonotactic mechanisms, they learn to identify individual words roughly by age one (cf. eg. Fisher and Gleitman (2002,[37]), Szagun (2013,[114])). At this stage, referentiality comes into play. Children begin to realize that some of these words refer to objects in the real world, e.g. the word *table* refers to the dining room table in their home. The identification of these conceptual mappings is a very important bootstrap into learning basic syntax and compositionality, i.e. how the combination of the meaning of two final nodes in a tree results in an overall meaning. Evidence reported in Roeper (2003,[95] and references therein) suggests that early syntax precedes early compositionality only by little, so that as soon as they learn hierarchical syntax, they will begin learning about the respective compositional meaning, and this is suggested to happen closely after age one. This semantic, or maybe rather conceptual bootstrapping is of course limited to those words in our language that can quite easily be mapped to distinct objects or events in the real world (cf. Fisher and Gleitman (2002,[37])). Other words cannot be captured with the same mapping mechanism[37]. Important for our purposes is the fact that as soon as children learn individual meanings of words (and here most often nouns), they begin to become sensitive to the structural surroundings of these nouns. In our case, the surroundings very often include the definite or indefinite article or a demonstrative article. And this is exactly the point in language development that is most relevant for us. Age-wise, we are dealing with a critical period that begins as soon as children learn first noun meanings, so roughly around the first year. Roeper (2003,[95]) and Guasti et al (2008,[49]) give a more detailed picture of which nouns, i.e. which meaning sets are acquired first by children. Roeper (2003,[95]) argues that children's first utterances of bare nouns, i.e. nouns without articles, are most often interpreted as kind-denoting. Guasti et al (2008,[49]) focus on children's omission of articles across different languages. They relate children's article omission to the Nominal Mapping Parameter (NMP, see Chierchia (1998,[17])), which specifies in which languages and under which interpretation nouns require the presence of an article. In languages where an article is required across the board, article omission should not be as frequent in child language as in languages where article omission is part of the target grammar, e.g. in English

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[37]For example, attitude verbs like 'think' or 'know' don't refer to physical events in the situation like 'kick' or 'push'. Rather, they refer to abstract mental concepts that can't be observed from the pure visual context alone. See Dudley (2017,[28]) for a more thorough discussion on these verbs.

and German for mass nouns. Thus, in these languages, children have to learn first that there is a distinction between mass and count nouns and that only count nouns need to be combined with an article. Guasti et al (2008,[49]) find that Dutch learning children indeed omit more articles than Italian and Catalan speaking children. However, the age of onset where children start using articles is reported to be roughly the same across all languages. For the current purpose, thus, the takeaway from these two papers is that English and German children might have some additional difficulty in distinguishing count and mass nouns and when these are combined with an article. However, I am only concerned with when they start understanding and producing articles, irrespective of additional difficulties with the noun-meanings, so that the issue raised in Guasti et al (2008,[49]) is tangential to this dissertation.

As roughly sketched, at this point in time, the necessary perceptual, conceptual and syntactic abilities are at place. But what about the socio-pragmatic abilities? These are directly relevant to the context-sensitive nature of pronouns and definites. In other words, once children start to interpret and using these constructions, they need to have a basic understanding of what the context is and what it means for an expression to be context-sensitive in the first place. More specifically, following pragmatic abilities are relevant for the use of pronouns and the definite article.

(110) 1. children have to be aware that communication is **cooperative**, (cf. Grice 1975).

2. childen have to be aware that communication is **intentional**, i.e. that each utterance within a discourse pertains to certain goals of the conversation. This includes that children are sensitive to the existence of following concepts:

   – **Common Ground**, i.e. a pool of commonly shared information (cf. Stalnaker (1978,[111])) and the conversational goal associated with it, namely to increase the information shared by all participants.

   – distinction between **given and new** information, such that given information is attributed to information within the Common Ground, while new information seeks to expand the Common Ground further.

   – tracking of given information. Children not only are required to distinguish new and given information, they are also required to continuously

keep track of what has been said and control if utterances that make reference to this already established information are felicitous, e.g. presupposition triggers.

3. children have to be aware that language in general is **referential**, i.e. especially Determiner Phrases refer to entities that exist in the discourse context.

4. children have to be aware of **discourse roles and perspective shifts**.

Research on the pragmatic requirements formulated in (110,1 and 3) has found that from a very early age on, and sometimes even in the preverbal period of language development, children are already sensitive to the purposes of communication. And not only that: the notions of cooperative and intentional communication helps children in their acquisition of more complex linguistic constructions. Roughly, children at age one to two demonstrate sensitivity to the goals within a conversation (see e.g. Behne et al (2005a,[9]) and (2005b,[10])), the Common Ground (see Liebal et al (2009), Clark & Bernicot (2006,[21])), to given and new information and the distinction thereof (see e.g. O'Neill (1996,[79]), Veneziano et al (1990,[117]) and Moll et al (2008,[75])) and to the interpretation of referring expressions (Hughes & Allen (2015,[61])).

However, concerning (110,3) it remains less clear how children distinguish between different ways to refer to entities in the context, such as using a pronoun instead of a definite article or an indefinite article instead of the definite. Here, we need a more fine grained method of testing. Studies that have focused on these distinctions will be introduced in more detail below.

Regarding (110,4), this issue is directly relevant to the use of pronouns and the definite article. In order to use those constructions, children have to be aware that there are specific discourse roles related to the speaker and the addressee of an utterance which shift constantly, depending on who is actually speaking. In addition, third person pronouns are often used to refer to people who do not participate in the conversation directly but are still salient and relevant. Thus, children have to be able to distinguish between discourse participants and non-participants and be aware of acceptable constructions that refer to one or the other (see Moyer et al (2015,[76])). Perspective shifts such as these have been attributed to the realm of "Theory of Mind", i.e. the ability to take into acount the knowledge state of others and the possible disparaty between these knowledge states and one's own.

These disparities are best observed in false belief scenarios. In these cases, it has been shown that children at age four seem to have some difficulty with such a shift in perspective (see e.g. de Villiers (2006,[118]; Astington and Baird (2005,[4]) for an overview). However, other studies employing implicit methods of testing, e.g. looking times, have shown that children at a very young age are sensitive to false belief reasoning (see e.g. Onishi and Baillargeon (2005,[80]), Song et al. (2008,[109])). Theory of Mind has been determined to be a "multifaceted system" (Astington and Baird (2003,[4]): 5). While much research has focused on complex false-belief reasoning or the interpretation of attitude verbs, there are more basic aspects of Theory of Mind which have to be taken into account, such as for example, the ability of perspective-taking, i.e. taking into account that the speaker's perspective is different from the listener's with regard to the discourse roles and the relevant background assumptions[38]. The most obvious example are the indexical pronouns 'I' and 'you', whose referent changes with each perspective shift. However, also regarding definites, it is relevant if children are able to reason about whether for their conversational partners, some referent is equally unique or familiar, or if only the child herself is familiar with the object. At this point, it is clear that the cognitive ability of perspective-taking is intertwined with the learning of reference. However, it is beyond the scope of this dissertation to find out what the exact relation between reference-learning and Theory of Mind is, i.e. if the former precedes the development of the latter or vice versa or if both are developped simultaneously. The only point I will make here is that once children are adult-like in their comprehension and production of reference, the consequence naturally is that at the latest at this point in their development, they must have learned the cognitive ability associated with Theory of Mind. Thus, this issue is tangential to the research aim of this dissertation and I want to remain agnostic about whether children acquire Theory of Mind before acquiring pronouns and definites or whether, by learning about the use of especially first and second person pronouns, children begin to become sensitive to Theory of Mind - and if some of the abilities associated with theory of Mind predict or enable the development of other, more complex, abilities, like, e.g. false-belief reasoning.

To summarize, we can see that some of the relevant socio-pragmatic prerequisites are acquired from very early on and form a basis for the acquisition of the more fine-grained

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[38]See Astington and Baird (2003,[4]): 5 for an overview of the range of Theory of Mind abilities.

distinction of reference as captured by pronouns and definites. However, it is not clear yet how these specifically different context-sensitive and referential constructions, like indexical and third person pronouns and the definite article, are acquired.

2.2.2   The Learner's Task: Trouble in the Input

We have now established that the critical time-period for the acquisition of pronouns and definites begins at roughly age one. As shown in detail above, at this point in their language development, children need to know that the language input they are exposed to is necessarily linked to the discourse context.

Thus, the key aspect within the learner's task regarding pronouns and definites lies in the contextual requirements that come along with the use of these constructions. Importantly, these are the same for a uniform and a classical approach. More specifically, the learner's task in acquiring the target grammar is to understand that when a pronoun is used, the context has to provide an identification of the intended referent, namely a salient non-participant. In the case of (111) below, for example, within the child's context, one entity has to be sufficiently salient. For example, it could be the case that the child is playing with or holding a book and the mother uses (111) to signal to the child to give her the book. However, the child has to be aware that in a different situation, 'it' might not refer to the specific book it is holding, but to a different, yet equally salient referent.

(111)   Give it to me!

(112)   Give me the book!

For the definite article, the learner's task is to track given information and see if the intended referent has already been introduced before as unique and familiar (note that in the case of pronouns, uniqueness and familiarity are necessarily inferred from salience). The NP complement of the definite article guides this backtracking. In the case of (112), a child has to backtrack its context and see whether some book has been uniquely introduced in the previous context. For example, an appropriate situation would include the caretaker playing with the child, not necessarily with the book, but maybe they have looked at the book previously, so that this book is still the only appropriate referent. In this case, the caretaker might utter (112) in order to get the child to go to the book, collect it and bring it to her. However, it is not required that this book be immediately salient.

Both the interpretation of pronouns and the definite article is much more fine-grained than the referentiality of first words, where a noun is mapped to a specific entitiy in the context and this mapping is constant across contexts. Instead, the mapping responsible for the use of pronouns is more abstract. Children have to reason about which referents are salient right now, whereas the mapping responsible for the use of the definite article depends on familiarity and uniqueness.

However, the above shown examples are highly idealized in that only the pronoun targets a salient referent, whereas the definite article targets a familiar, unique referent. While pronouns tackle salient referents, uniqueness is given by virtue of a ranking of discourse referents, as well as familiarity. For the definite article, only familiarity and uniqueness are required, but that does not exclude the referent from being salient in the context as well. Thus, the necessary prerequisites can be sharply distinguished, but those contextual restrictions which also possibly apply without being obligatory might present the child with a tricky puzzle. In this section, I want to show, by discussing three exemplary exchanges between a caretaker and a child, how the spontaneous and natural input children encounter when acquiring pronouns and definites looks like and which challenges it poses, in contrast to the highly idealized examples often given in formal theory. The first example is taken from the MacWhinney Corpus (MacWhinney (2000),[72]).

(113) Mark Corpus, transcript 38b2.cha; age of Mark: 1;5; age of Ross 3;4
Situation: Ross (Mark's brother) and his father (abbreviated with FAT below) are talking about and playing with a Luke Skywalker figure. Ross names the holes on Luke's helmet beagles.
ROSS: watch this. Luke Skywalker could fly in and say whoa. Okay ?
FAT: okay.
ROSS: Luke Skywalker (.) whoa .
FAT: whoa . cute .
ROSS: he can stand up and say damn it . damn [!] it [!] .
FAT: he said damn it ?
ROSS: gotta get **this beagle** out of my hat .
FAT: what out of his hat ?
ROSS: beagle .

FAT: what's **a beagle** ?

ROSS: **he**'s in his hat .

FAT: **a beagle** is in his hat [!] ?

ROSS: yeah . this is his hat .

FAT: where's **the beagle** ?

ROSS: in here .

FAT: let me see here .

ROSS: **he** sneaks in there .

FAT: a beagle ?

ROSS: see .

FAT: what's **a beagle** (.) Ross ?

ROSS: **he**'s right in there (.) now see ?

FAT: but what is **it** ?

ROSS: see ?

FAT: yeah (.) I see **it** (.) now what is **a beagle** ?

ROSS: **the beagle** was when Luke Skywalker and his head .

FAT: oh .

ROSS: so there's **a beagle** in here (.) a beagle in here and a beagle in here and a beagle in here . see ?

FAT: I see .

ROSS: cause **there's beagles** on my hat .

In the exchange in (113), Ross and his father are playing with a Luke Skywalker doll with a hat. Ross uses the demonstrative 'this beagle' initially, talking as Luke, to refer to small holes on Luke's hat. His father's reaction demonstrates that he is not familiar with what Ross terms a beagle. This suggests that while for Ross, the beagle, as a type of object and as the particular token which he refers to in this specific situation, is familiar and unique for him, it is not so for his father. This is why his father continues using the indefinite article to refer to the kind of object a beagle could possibly be. Interestingly, Ross's reaction demonstrates that Ross keeps referring to the token of the object, not the type. He uses the pronoun 'he' to refer to the beagle. This is appropriate, as the beagle has been made sufficiently salient through their conversation. However, his father continues to refer to the beagle with the indefinite article, targeting the type of object, whereas Ross continues to

use 'he'. Then, his father asks for the specific token by using the definite article 'Where's the beagle?'. Here, this utterance is also appropriate, because the father is now referring to the specific token. By asking 'but what is it?', the father uses a pronoun to refer to the salient object. However, he could both mean the specific token or the type of object, as both are by now salient. The situation becomes even more complex when at the end, it becomes clear that there is not only one beagle on the hat, but several ones. When Ross reveals this, he switches to the indefinite article and the bare plural, as here, uniqueness is not given anymore.

To summarize this small exchange, we see that natural language input is far from clear regarding the contextual requirements of using a pronoun, a definite or even an indefinite article. Ross is targeting the specific token of the object, so the visually present unique object on the hat, whereas his father targets the abstract notion of the type of object. Ross' use of the three phenomena mark the rise in salience of the referent. From a learner's perspective, immediate problems arise. For Ross, it might not be clear that his father and he communicate about two different aspects of the same object. However, only if this distinction is made, a distinction can be drawn between the phenomena with respect to the contextual requirements that go along with using them. If this distinction is not drawn, it might be unclear why Ross and his father use four different constructions to refer to one and the same object.

In the next example in (114), Naomi and her mother are dressing a doll.

(114)   Naomi-Corpus, transcript n09.cha; age of Naomi: 1;10
        Situation: Mother (MOT) and Naomi (CHI) are playing with three dolls, dressing and undressing them.
        CHI: on blanket . blanket over .
        MOT: hmm (.) yeah .
        CHI: another blanket over . xxx .
        MOT: oh (.) you've got **rubber pants** for the baby too . maybe we could put **this** on Sandy . he's big enough . he could have **some rubber pants** on . take **these pants** off of him .
        CHI: pants off . other shoe .
        MOT: what honey ?

CHI: other shoe .

MOT: now you can put the pants on .

CHI: pants on . off .

MOT: put this up a little bit . now you can get his hands out . you want it off ?

CHI: want it off .

MOT: okay (.) want it off ?

In this exchange, Naomi's mother is using definites, demonstratives and the bare plural interchangeably for the rubber pants in the situation. First she identifies them, then she refers back to the pants with the demonstrative 'this'. However, she uses a quantified NP 'some rubber pants' to talk about the kind of pants rather than this particular pair, similar to Ross's father above. Then, she differentiates between the rubber pants and the pair of pants the doll is currently wearing by using the demonstrative 'these pants' to refer to the latter. In the later part of the exchange, she uses the demonstrative 'this' and the pronoun 'it' deictically in reference to particular parts of the clothes that seem to be deictically salient enough. Here, the same difficulty arises for the learner as in the previous example. Naomi's mother uses both definites and indefinites to refer to the particular pair of pants visually present in the situation and to pants in general. She marks the difference between the abstract and concrete referent more clearly than Ross's father by using demonstratives for the latter and indefinites for the former case. Then, she uses the definite article 'the pants' for the familiar and unique pair of pants later, which are not immediately salient anymore. In turn, she uses 'he' appropriately to refer to the just talked about doll Sandy. Overall, demonstratives and pronouns seem to be used more often in reference to the direct situation. However, the same problem for the learner arises. How can we make sure that the difference between an abstract referent and a concrete one is sufficiently clear for the learner to see the difference between using an indefinite and a definite article?

I want to give a last example of a caretaker-child exchange from the Violet Corpus.

(115)   Violet-Corpus, transcript vio14.cha; age of Violet: 1;8

Situation: Mother (MOT) talks to Violet (CHI) about a Baby Bird they saw yesterday.

MOT: do you remember when we saw **the baby bird** yesterday ?

MOT: did we see **a baby bird** ?

MOT: at gramma [: grandma] and grandpa's house ?

MOT: did you see **that baby bird** ?

CHI: yeah .

MOT: how come **it** wasn't in the nest ?

MOT: did grampa put it back in its nest ?

MOT: grampa +//.

MOT: grampa picked up **the baby bird** (.) and put **him** back in his nest , huh ?

MOT: yeah .

MOT: (be)cause **he** fell out of his nest .

In this exchange, (115), Violet's mother is telling Violet about a baby bird that they encountered at her grandfather's house the day before. Here, she uses the definite article right away referring to the baby bird. This is appropriate as both Violet and she seem to have been present at that past situation. However, she switches back to the indefinite article to ask Violet if she remembers. Next, however, she switches once more to a demonstrative 'that baby bird'. Then, after having established that Violet knows who she intends as a referent, she continues by using the pronoun 'it', and later 'he', to refer to the bird. At this point in the conversation, the bird is salient enough. However, she uses the definite article 'grampa picked up the baby bird' even though she has already switched to using a pronoun - so here, the referent is salient, but a definite article is used to refer back to the referent.

To summarize, Violet's mother uses different phenomena to refer to one and the same referent. Here, different from the other two examples, there is no distinction between abstract and concrete referents, however, the main complication for the learner arises because not only the pronoun refers to the salient referent, but also the definite. This is appropriate in both the classical and uniform view, as the use of the definite article is not restricted to non-salient referents, rather, this requirement is not obligatory. Another problem is the use of the indefinite and definite article in the beginning. Even though the mother appropriately uses the definite article to refer to the familiar and unique baby bird they saw the day before, she also uses the indefinite article later to refer to the same referent. The difference in both cases lies in her communicative intention. In the first sentence, she refers to the specific situation, in which she thinks it is clear that there is a familiar and unique bird. However, in the second sentence, she seems to be doubtful about Violet's recollection of

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the situation and rather asks her if she remembers any bird at all. This reasoning might not be clear enough for Violet, and thus, there may be not enough evidence from the input to distinguish between using the definite and indefinite article.

All three examples demonstrate that the actual referents for pronouns, definites and demonstratives can be one and the same. In other words, often the obligatory and optional contextual requirements overlap, so that it is not clear from the input alone how a learner can distinguish between them. This overlap is compatible with both the uniform and classical view. However, it is this overlap which is the main difficulty for the learner. They have to be able to distinguish between obligatory contextual requirements of the phenomena and requirements that are given by the context but do not contribute necessarily to the interpretation and use of the constructions. How can a learner achieve this goal? Tables 2.3 and 2.4 illustrate this point further.

Construction	Uniqueness	Familiarity	Salience	Deixis
Definites	✓	✓	(✓)	(✓)
Demonstratives	✓	✓	(✓)	✓
Indefinites	-	-	-	-
Pronouns	(✓)	✓	✓	(✓)

Table 2.3: Contextual Restrictions as Proposed by Theory

The clues predicted by theory are given in Table 2.3, where the checkmarks represent which contextual restrictions are obligatorily required by the analysis of the phenomena, and the checkmarks in brackets represent that here, these restrictions, even though they are not required by the analysis, might happen to be met when the relevant construction is used. The obligatory requirements are uniqueness for definites, deixis for demonstratives, the lack of all requirements for indefinites and salience for pronouns. However, the three illustrative cases above demonstrate that the input might be a lot messier than that. This is illustrated in Table 2.4 below, where the checkmarks represent which restrictions are indeed met in the contexts for each construction, and the double question marks demonstrate for which restrictions the context gives mixed signals, i.e. sometimes they are met for the relevant construction, and sometimes they are not met. Throughout the three conversations, uniqueness does not seem to be a strong predictor for the use of a definite,

not even in comparison to the indefinite article, as practically all referents for either construction are unique. Especially in the case of the indefinite article, it is used for unique and even familiar referents (see especially (113) and (115)). The definite article, in comparison to pronouns, is also used to refer to salient referents (see (115) and (114)). Thus, salience does not seem such a strong and exclusive predictor for the use of pronouns either. However, all three exchanges demonstrate that demonstratives and pronouns are used in reference to the immediate context, i.e. they are used deictically. Moreover, demonstratives are used to newly address some object present in the situation, while pronouns are used to refer to deictic objects that have furthermore been talked about previously. This might suggest that deixis, so the immediate context of the utterance, might be the clearest predictor for demonstratives and pronouns.

Construction	Uniqueness	Familiarity	Salience	Deixis
Definites	✓	✓	✓	??
Demonstratives	✓	??	??	✓
Indefinites	✓	??	-	??
Pronouns	✓	✓	✓	✓

Table 2.4: Contextual Restrictions as Met in the Input

The pragmatic component of the analysis of pronouns and definites has shown that the language input provides confusing uses of the constructions, where the contextual requirements that are obligatorily related to each phenomenon are hard to tease apart from those requirements that just happen to apply to the intended referent. Still, the illustrative examples above only give an incomplete picture of the input. In section 2.2.1, we have seen that babies make use of distributional evidence to parcel out the speech stream into individual sentences and words (see Fisher and Gleitman (2002,[37]) and Szagun (2013,[114]). Thus, distributional evidence might help in distinguishing between the obligatory and the optional requirements that are associated with pronouns and definites, respectively. Even though the interchanges above demonstrate that these overlap, children will likely observe that the use of the constructions is more often associated with referents that meet the obligatory requirements than with referents that happen to meet optional requirements. And indeed, Rozendaal and Baker (2009,[97]) find evidence supporting this view (see Section 2.2.4, page 97). Next to distribution, the question arises if there is anything else within the

target grammar that can help children in figuring out the correct analysis.

One aspect that comes to mind is the syntactic environment of the phenomena. The syntactic environment has proven fruitful for learning the meaning of attitude verbs and other more abstract meanings. In our case, however, pronouns and definites, as well as indefinites, are in complementary distribution and are structurally felicituous in the same environments, except that pronouns do not operate on (at least overt) NP complements. Thus, the syntactic side might not give strong enough clues - at least for free occurences of the phenomena[39].

2.2.3   Two Pathways to the Target Grammar

As we can see, the learner's task, especially regarding the mastering of the contextual requirements of use of pronouns and definites, is very complex - this is the case under both the classical or uniform approach. Hypothesizing about possible pathways to an either uniform or classical target grammar depends on the individual predictions of the theories and possible clues in the input on the one hand, but is also influenced by more programmatic assumptions, e.g. if a nativist or constructivist view on language acqustion is taken in general. This general opposition of views will be briefly discussed in the following section before turning to the predictions for the acquisition process more explicitly.

Theoretical Claims in Light of General Questions in Language Acquisition

The target grammar is the goal in language acquisition irrespective of if a nativist or constructivist approach is assumed. And thus, the focus of this dissertation is on how this goal of language acqustion is achieved by children.

The basis for the formal analysis and definition of the adult-like grammar here is generative grammar. Generative grammar has brought about and is closely associated with a nativist view. However, only because grammar here is modelled in the tradition of generative grammar, it does not necessarily have to follow that the view of the acquisition process should be a nativist view. Generative grammar wants to capture natural language with the help of a highly abstract set of grammatical rules that are applicable to the whole

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[39]The behaviour of definites and pronouns under binding could be a possibility of a clearer distinction between the respective phenomena.

range of sentences existing. Any grammar has to be sufficiently abstract to capture the fact that although we are likely to frequently create new sentences which noone else has heard before, our conversational partners are able to understand them. Likewise, a child constantly is confronted with sentences it has not heard before. It makes sense to assume that, at some point in language development, a child can understand these new sentences on the basis of abstract language rules. The nativist and constructivist view differ in how a child arrives at these abstract rules, not so much if these rules exist and can be formally modelled or not.

To be precise, the nativist view on language acquistion argues that natural language grammar is innate (cf. Chomsky (1981, [19]); Chomsky (1986, [20])). Under this view, everyone is born with a Universal Grammar (UG) which is composed of principles and parameters. Principles are those aspects of natural language that are equivalent in all languages of the world, parameters specify the differences of each language of the world. The task of a language learner is to set the parameters of UG relative to its specific native language. This does not require a lot of language input. Principles do not have to be learned, they are innertly present. In our specific case, the parameter setting of English under a uniform view includes that definites and pronouns are analyzed in parallel, while the parameter setting of English under a classical view does not include this dependence.

A constructivist view assumes that, irrespective of if UG might exist or not, grammar is not innate (see discussion in Szagun (2013,[114]) and further references therein). That means that children have to acquire their target grammar by abstracting away from the input alone. The ability of learning a language is directly related to general abilities of learning and include immitation, categorizing, generalization and building of schemata. Constructivists argue that these are prerequisities not specific to language learning, but necessary for any learning of a child. Furthermore, a child is assumed to go from specific language rules concerning specific words or constructions to abstract rules that then at some point are identical to the adult grammar. However, also in a constructivist approach, it is important if certain constructions are dependent on each other in their analysis. If they are, it is likely that the acquistion of the one construction depends on the acquisition of the other. Thus, the observation of a recurring pattern of the order of acquisition is not nessecarily a sign for an innate grammar. Instead, a constructivist would predict that in our specific case, children would acquire pronouns and the definite article by way of

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at first formulating specific rules for each construction, e.g. each pronoun, and then later abstracting away from these specific rules. The way from the specific rules to more abstract rules could be systematic, supporting the uniform view, or variable, being compatible with the classical view.

Still, differences in the predictions following a nativist or constructivist view lie in the way individual hypotheses about the acquisition process can be formulated. Under a nativist view, the underlying presence of UG restricts which hypotheses can be drawn, as the right analysis of the constructions is already given and children rather need to identify it. In a constructivist view, children do not have this underlying knowledge and might at first entertain more hypotheses that are not compatible with the target grammar. For example, a nativist might argue that because of the innately existing language system, children will know that under a uniform target grammar, the NP complement of pronouns is silent. In a constructivist view, it might be the case that children in some point in their development combine pronouns with an overt NP complement, as they still have to construct the right rules - here, NP deletion. Only after having observed enough of the input, they might revise this hypothesis. Thus, the burden of the learner's task is heavier under a constructivist view, as here, we might expect more errors and more variation across children.

However, the question of interest is relevant for both approaches: how do children arrive at an adult-like use of pronouns and definites and does the pathway to adult-like use demonstrate a recurring pattern or not? In a nativist view, a child *identifies* this recurring pattern, in a constructivist view, it *constructs* it.

In the following section, I will give an overview of possible pathways to either a uniform or classical target grammar. For these pathways, I will exclude the possibility that adults entertain several different target grammars (an assumption that can be drawn under a constructivist approach) or that children's acquisition process might contain stages where children assign a non-adult-like interpretation to definites and pronouns. Whereas both assumptions can certainly be entertained, I want to focus on those aspects of language development that cannot be ignored by either nativists or constructivists - and these are the aspects leading to an adultlike target grammar as modelled within the classical or uniform view.

Identification of Pathways towards a Uniform or Classical Target Grammar

How could a plausible pathway to the respective target grammar look like? The starting point for both accounts is that children observe the syntactic distribution of DPs. In section 2.2.1 on page 59, we have seen that by age one, children start to acquire basic syntax and compositionality, bootstrapped by the referentiality of some word meanings. This stage sets the scene for the child's observation that proper names, definites, indefinites, demonstratives and pronouns all share a syntactic category due to their overall distribution in the clause. This first stage in the developmental process of the acquisition of pronouns and definites is illustrated in Table 2.5 below: First, children understand the syntactic distribution of DPs in general.

Stage 1	Identification of the DP-Category	*Comprehension*

Table 2.5: Stage 1

As syntax and meaning are closely related in the acquisition process (shown in Roeper 2003,[95]), children could reason that the constructions identified as DPs not only share a syntactic category, but also a semantic category. I.e. that DPs are all referential. This stage, stage 2, is illustrated in Table 2.6 below. Note that this stage only concerns children's comprehension, and not yet their production.

Stage 1	Identification of the DP-Category	*Comprehension*
Stage 2	Meaning of DPs: Referentiality	

Table 2.6: Stage 2

From this point in the acquisition process forward, the predictions made by the uniform and classical view will provide different pathways. I will first consider a pathway leading to a uniform target grammar. In the next stage, children might grow sensitive to the underlying structure of DPs, namely that they get decomposed into a Determiner and a Noun Phrase, illustrated in Table 2.7 below.

However, children at this stage do not necessarily know which meaning component exactly is provided by the D. In terms of the uniform view, two things have to happen next. First, children need to understand that indefinites are to be analysed differently than definites,

Stage 1	Identification of the DP-Category	*Comprehension*
Stage 2	Meaning of DPs: Referentiality	
Stage 3	Decomposition: DP = D + NP	

Table 2.7: Pathway to a Uniform Target Grammar: Stage 3

demonstratives and pronouns. Second, they might reason that the Ds of definites, demonstratives and pronouns come with the same interpretation (see Table 2.8). This assumption is crucial for a uniform view approach to language acquisition.

Stage 1	Identification of the DP-Category	*Comprehension*
Stage 2	Meaning of DPs: Referentiality	
Stage 3	Decomposition: DP = D + NP	
Stage 4	Semantic Uniformity of D	

Table 2.8: Pathway to a Uniform Target Grammar: Stage 4

At this point in the development, where we are still considering children's comprehension of the constructions, two different factors influence the acquisition pathway: either, the composition of the constructions or the direct context. I will start with the former possibility, composition.

Compositionally, the DP with the definite article as its head provides the clearest implementation of the compositionally derived meaning of the DP, as it includes an overt NP complement. Thus, children might arrive at a first interpretation of the definite article as a functor which captures a one-to-one mapping between the DP and the referent in the context. As a consequence, at this point, children might start using the definite article in combination with its NP argument with an intended referential meaning, i.e. a meaning where the compositional combination of the article and the NP complement derives a type $< e >$ interpretation of the overall DP (see Table 2.9).

After children have acquired, i.e. understood and started producing the DP in the way described, the next step for them is to transfer the full-fletched compositional analysis of the definite DP to pronouns. Here, children already know that the compositional analysis is the same, because of their assumption about semantic uniformity of the Ds at stage 4.

Stage 1	Identification of the DP-Category	*Comprehension*
Stage 2	Meaning of DPs: Referentiality	
Stage 3	Decomposition: DP = D + NP	
Stage 4	Semantic Uniformity of D	
Stage 5	Use of Definite Article + NP (*Overt Structure*)	*Production*

Table 2.9: Pathway to a Uniform Target Grammar Guided by Composition: Stage 5

The only difference between the definite NP and pronouns is that in the latter case, the NP complement is deleted. Children might be puzzled as to why the NP complement is deleted when a pronoun is used in the input. This developmental stage is completed once children use pronouns without an overt NP complement (see Table 2.10). Their use of a pronoun should equally capture a one-to-one mapping between the pronoun and a contextually given referent.

Stage 1	Identification of the DP-Category	*Comprehension*
Stage 2	Meaning of DPs: Referentiality	
Stage 3	Decomposition: DP = D + NP	
Stage 4	Semantic Uniformity of D	
Stage 5	Use of Definite Article + NP (*Overt Structure*)	*Production*
Stage 6	Use of Pronoun (*Covert Structure*)	

Table 2.10: Pathway to a Uniform Target Grammar Guided by Composition: Stage 6

Importantly, this step is a stipulation necessary within a uniform view approach. In a nativist view, this step does follow from the underlying UG. If a uniform target grammar is innate, the only task of the child is to identify the parallelity of pronouns and definites. In a constructivist view, it is much harder to see how children might realize that pronouns are associated with a covert NP complement. One clue could be provided by children hearing donkey anaphora. These cases can not as clearly be analyzed under the classical view and thus could lead the child to connect their analysis of the definite with these cases. However, it is unclear whether children understand the meaning of donkey anaphora at this stage.

As a consequence, for now, I have to keep stipulating that children are sensitive to the parallelity of the compositional analysis of pronouns and definites somehow. However, as the key driving forces for language acquisition are generalization and analogy (cf. Szagun (2013,[114]) and Tomasello (2003, [115])under the constructivist view, the assumption of the uniform syntactic and semantic interpretation of D does not seem as far fetched. Regarding children's use of pronouns at this stage, we might expect children to erroneously use pronouns in combination with an overt NP complement under a constructivist view or when children are not considered to be conservative, i.e. to only produce a construction once they have understood the complete compositional (and pragmatic) analysis (cf. Snyder 2007,[107]).

Overall, in this compositionally driven version of a pathway towards a uniform target grammar, the acquisition process happens 'bottom-up', i.e. the internal composition of the constructions drives the acquisition pathway, where children's comprehension and production goes hand in hand.

The second possibility of arriving at a uniform target grammar highlights the importance of the direct context for the production of pronouns. We could assume that children have passed Stage 4 and do indeed understand that both definites and pronouns are functors within a DP containing an NP complement (as before, we have to stipulate that this is the case), which is deleted in the case of pronouns. In their language production, however, they might be guided by the same mechanism that helped them learn the meaning of bare nouns (cf. section 2.2.1 above): a mapping between the intended word and the referent available in the context. In Section 2.2.2, we have seen examples where the strongest clue in the input is the direct context, e.g. where a pronoun or demonstrative is often accompanied by a pointing gesture and a concrete referent is available. Thus, these contextual clues could be stronger than those clues for the definite article. As a consequence, children could start with producing pronouns, because the context provides a more explicit one-to-one mapping between the pronoun and its referent compared to when a definite article is used. While they might understand that using a definite also yields a referential interpretation, finding a suitable referent might just be easier in the case of pronouns. Only after that, children might proceed with producing the definite article. This version of the pathway represents a 'top-down' approach to children's acquisition, as the information provided by the context, i.e. the nonambiguous identification of the referent, is

the driving force for the acquisition process, especially regarding children's production of the constructions. While the compositional analysis is at place in children's language comprehension, the availability of an explicitly given referent in the case of pronouns aids children's production of pronouns, such that these are produced before the definite article. This alternative version of a pathway to a uniform target grammar is illustrated in Table 2.11: here, stages 5 and 6 demonstrate the reverse order as in the compositionally guided pathway above.

Stage 1	Identification of the DP-Category	*Comprehension*
Stage 2	Meaning of DPs: Referentiality	
Stage 3	Decomposition: DP = D + NP	
Stage 4	Semantic Uniformity of D	
Stage 5	Use of Pronoun (*Stronger Contextual Clues*)	*Production*
Stage 6	Use of Definite Article + NP (*Weaker Contextual Clues*)	

Table 2.11: Pathway to a Uniform Target Grammar Guided by Contextual Clues

Both the 'bottom-up' (see Table 2.10) and the 'top-down' approach (see Table 2.11) are equally plausible.

To summarize, the main difference between the two pathways lies in children's production behaviour. Either, the production goes hand in hand with their comprehension of the compositional analysis, or their comprehension of the compositional analysis precedes their production, which in turn is mainly guided by the nature of the context.

In the case of the *classical view*, the development of the compositional analysis of the DP is important for learning the definite article, while the direct context guides the learning of pronouns. Importantly, the acquisition of pronouns aided by the presence of an explicitly identifiable referent is independent from the acquisition of articles, both in terms of their comprehension and production. Thus, while definites and pronouns might follow the same preliminary stages, where the child identifies their syntactic category and might even assume that they both receive a referential interpretation (these were stages 1 and 2 above), pronouns and definites, after stage 2, follow unrelated pathways. For definites, children still need to become sensitive towards the internal composition of the DP. But for pronouns, they need to become aware of the mapping between the pronoun and its referent

in the context. In terms of an acquisition process observable over time, both mechanisms can happen at different points in time, as they are not directly dependent on each other.

	Definites	Pronouns	
Stage 1	Identification of the DP-Category		*Comprehension*
Stage 2	Meaning of DPs: Referentiality		
Stage 3	Decomposition: DP = D + NP	Mapping	
Stage 4	Use of Definite Article + NP	Use of Pronoun	*Production*

Table 2.12: Pathway to a Classical Target Grammar

As a summary, while in both the uniform and the classical view, prerequisites for the definite article include structural abilities and an understanding of the contextual requirements, only in the case of the uniform view are both aspects equally relevant for pronouns as well. In the classical view, only the direct context is necessary for understanding and producing pronouns. As a consequence, only the uniform view predicts that the production of pronouns depends on the production of definites, either following the clues from the direct context or following the composition. The classical view does not predict any interdependence of the acquisition of pronouns and definites, without excluding other possible reasons for a possible recurring pattern that are not related to the linguistic analysis.

The two pathways above have shown that the uniform view and the classical view make different predictions for the acquisition process of pronouns and definites. However, in addition to the relation between pronouns and definites and their possible interdependence, the question arises how their respective internal analysis is acquired, irrespective of which theoretical approach is taken. In both pathways, children know that the analysis of either construction requires a one-to-one mapping between the construction and its referent. However, this is not the end of the acquisition process, as both definites and pronouns are much more refined in which referents are suitable candidates for the individual constructions. Thus, a necessary following stage to stage 6 in the case of a pathway to a uniform grammar or, in parallel, stage 4 in the case of a pathway to a classical grammar, captures children's growing sensitivity towards these additional contextual requirements of definites and pronouns. In other words, the overall acquisition process of acquiring pronouns and definites is completed only after these more fine-grained distinctions have been ac-

quired. Thus, in the next stage, children learn to identify the appropriate referent for the individual constructions within the two groups, illustrated in Table 2.13.

	Definites	Pronouns
Final Stage	Unique and Familiar Referents	Salient Referents

Table 2.13: Final Stage: Identification of Referents

In the case of definites, the mapping between the definite article and its referent has to be guided by selecting only unique referents. In addition, the referent for a demonstrative has to be unique and anaphorically available, according to its analysis on page 31. Likewise, it is not enough for pronouns to establish an explicit one-to-one mapping between the pronoun and its referent. Children have to understand that pronouns require the salience feature as analysed in section 2.1.3 on page 55. This is the case for all (personal) pronouns. Additionally, the referent has to match the gender and number requirements of the pronoun. These differ for the individual pronouns. The question arises if between the critical stages above, where children are able to produce definites and pronouns and capture a one-to-one mapping between the constructions and their referents, and the completion of the final stage, we find that children use pronouns and definites inappropriately, e.g. by using a pronoun for a non-salient, but unique referent or by using a definite for a non-unique referent or by using a female pronoun for a male referent and so on. Alternatively, it could be the case that already at the end of the critical stages above, children simultaneously know about the additional presuppositions and use the constructions appropriately. Again, we might expect more errors under a constructivist view.

Coming back to the pathway to a uniform target grammar which is mostly guided by composition (see Table 2.10), the time course of when the additional pragmatic requirements are acquired necessarily follows a specific order, namely that the uniqueness and familiarity requirements of definites are acquired - both in terms of comprehension and production - before the salience-feature of pronouns. In the latter case, the salience feature (and the contextual restriction C_{SAL}, see page 55) is integrated into the internal DP structure, making it compositionally more complex than the DP structure of definites. In the alternative version of the pathway to a uniform grammar where the contextual clues guide the process, we do not expect such a temporal ordering, as in this case, comprehension of the construction precedes the production. With a classical target grammar, we do not expect

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an ordering either, as the acquisition processes of definites and pronouns follow seperate paths.

To summarize, in addition to the possible interdependence in the acquisition pathways regarding pronouns and definites, children need to learn about the more fine-grained pragmatic distinctions within each group.

2.2.4 Previous Work

Coming back to the main aim of this dissertation, which has been specified in the sections above in identifying two possible pathways to a target grammar, I now want to introduce relevant findings from studies of children's language development about definites and pronouns. More specifically, I will concentrate mainly on four subfields within the broader topic of acquisition of pronouns and definites, each time going into detail into one or two studies each which give the most recent and relevant insights for this dissertation: Acquisition of Pronouns, Acquisition of Pragmatic Requirements on Pronouns, Acquisition of the Definite Article and Correlation of Production of Pronouns and the Definite Article. Each of these aspects is important to establish at which approximate age children start producing and understanding pronouns and definites in general, if and how previous studies can contribute to the claim of interdependence or to the two possible pathways identified above and in what way the specific role of context has already been looked into further. Once we have these facts at hand, we can come to more detailed hypotheses and research questions, putting emphasize on those aspects which have been left unexplored up to now.

Acquisition of Pronouns: Moyer et al. (2015,[76])

Previous studies have at most looked at pronouns and definites separately. It has been observed that children start producing pronouns from very early on and roughly seem to understand them by two years of age (see a collection of studies of both the production and comprehension of pronouns in e.g. Cruttenden 1977 ([26]); Shipley and Shipley (1969,[106]), Chiat (1981,[16]), Huxley (1970,[62]), Halliday (1975,[50]); Charney (1980,[15]), Loveland (1984,[71]); Moyer et al. (2015,[76])), even though there are differences in which specific personal pronouns are produced first. Overall, a production-comprehension assymetry has been observed, such that children start producing first per-

son pronouns first, then second and lastly third person pronouns, while they understand second person pronouns first, then first and last third person pronouns (see e.g. Charney (1980,[15])). However, Moyer et al. (2015,[76]) correctly observe that a natural discourse setting is not present in the studies on children's comprehension of pronouns reported in Charney (1980[15]) or also Oshima-Takane (1985,[81]) and (1988,[82]), which could have a significant effects on children's perfomance, given the context sensitivity of pronouns in general.

To gain a better understanding of previous work, I will concentrate on Moyer et al. (2015, [76]), as it is the most recent study that includes a natural discourse setting for two year old's comprehension of personal pronouns. More specifically, they want to see whether children are sensitive to the different discourse roles associated with pronouns, where 'I' always refers to the speaker, and switches referents as soon as somebody else speaks, 'you' refers to the addressee and also shifts for each change of speaker within a conversation and finally, third person pronouns refer to non-participants of a conversation. To manipulate discourse roles, Moyer et al. designed a hiding game experiment where the child helps one experimenter (E1) build a block structure, while another experimenter (E2) builds her own block structure and is not directly participanting in the discourse between child and E1. E1 hides blocks in either of three boxes, E1's box, the child's box or E2's box. Target items differ in addressed and non-addressed speech, i.e. sometimes E1 will give the clue directly in talking to the child, and sometimes E1 and E2 talk and E2 gives the clue, but not by addressing the child directly. This difference is so far important as it tests whether children are sensitive to the respective discourse roles of pronouns (see more details in Moyer et al. (2015,[76]): 4). Clues differ in which pronoun is used, i.e. 'It's in {my/your/her} box!'[40]. Referents change depending on if it is addressed or non-addressed speech. In addressed speech, so when E1 and the child converse, 'my box' refers to E1's box, 'your box' refers to the child's box and 'her box' refers to E2's box. In non-addressed speech, where E2 talks to E1, 'my box' refers to E2's box, 'your box' to E1's box and 'her/his box' to the child's box. An adult control group was tested as well. Results show that 2 year olds are mostly adult-like in their choice of boxes, but that they perform more poorly when hearing

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[40]Note that throughout the experiment, the possesive forms of the pronouns are used. Still, the children's behaviour nessecarily reflects both if they understood the possessive nature of the pronoun and the correct referent. This is why the possessive nature will not be relevant in the following discussion.

a third person pronoun. However, performance is still improved compared to previous studies. Also, the gender of the third person pronoun helps. The two experimenters are female, and if the child is female, the third person pronoun 'her box' is ambiguous and can refer to either person, disregarding the discourse role. When the child is a boy, 'his box' unambiguously refers to the boy. Results confirm that boys do better in this condition than girls, but still both groups manage the task in an adult-like fashion in most cases.

To summarize, Moyer et al (2015) confirms that already 2 year olds are almost adult-like in their comprehension of the personal pronouns 'I', 'you' and 'he' or 'she'. Importantly though, in this experimental setting, salience is given for all three discourse participants. Speaker and addressee are salient by virtue of their role as discourse participants, and the third person is salient just because she is the only additional referent present. Thus, an important follow-up question that Moyer et al. (2015,[76]) leave open is if children target salient referents when there are other non-salient referents available in the context. In the comprehension study in chapter 4, we set the situation in order to accommodate this difference. Additionally, a question left open here is if children understand different pronouns equally well, comparing for example 'it' and 'he' or 'she' at that age. The production study in chapter 3 will take into account possible differences in production of the individual pronouns.

Acquisition of Pragmatic Requirements on Pronouns: Song an Fisher (2003,[110])

Song and Fisher (2003,[110]) tested whether children demonstrate sensitivity to discourse prominence in their interpretation of pronouns, in a series of four experiments. Overall, the psycholinguistic literature suggests that pronouns refer to salient referents, as predicted by Roberts (2003,[94]). Among three preferential looking experiments, they start out by discussing an elicited imitation task. The basic setup was that 3 year olds were asked to listen to a story, accompanied by pictures. In the story, two discourse referents were mentioned equally often, however, only one of them was made prominent through word order, subjecthood and its realization as a pronoun. Then, children had to repeat the target sentence at the end of the story, where a pronoun either referred to the prominent referent or to a new referent (see (116) and (117) below). Control target items included a definite NP that referred to the referent in question. Note that the presence of the NP argument of the definite article prevents us to conclude anything for the influence of prominence on the

definite article per se.

(116) Prominent Referent:
Story: Meet the crocodile and the toad. The crocodile went on vacation with the toad. And she swam in the sea with the toad.
Target: She (Control: The crocodile) walked along the beach with the toad.

(117) New Referent:
Story: Meet the toad and the crocodile. The toad went on vacation with the crocodile. And she swam in the sea with the crocodile.
Target: She (Control: The crocodile) walked along the beach with the toad.

Adult controls were presented the same material in a self paced reading or listening task. Results show that children are more accurate in their repetition if the pronoun refers to the prominent referent. Adults are quicker in reading or listening to the target sentence with the pronoun refering to the prominent referent. However, no significant difference was observed between the pronoun cases and the controls (definite NPs), whereas adults were quicker when a pronoun refered to the prominent referent rather than a definite NP.

Experiments 2 to 4 tested preferential looking in children, as the measure is more sensitive to online processing. In experiment 2, the same stories were used as in experiment 1, except that children were not required to repeat the target sentence anymore. Instead, their fixation on the correct discourse referent was measured. For that, two screens simultaneously showed pictures of the two discourse referents while children listened to the story (see Figure 2.1).

Results confirm the findings in experiment 1. Children look at the prominent discourse referent right away when hearing a pronoun, while only later switching to the new referent in contexts as in (117). Adult controls confirm these results.

Experiments 3 and 4 further test which specific factors determine discourse reference. In experiment 3, the pronominalization within the story is replaced by a definite NP. In experiment 4, the third context sentence is left out altogether. The results in both experiments still demonstrate the same effect, namely that children are sensitive to discourse prominence, even though it is only encoded by word order and subjecthood.

Overall, Song and Fisher (2003,[110]) demonstrate that children are sensitive to pronouns referring to highly salient referents. However, the design in Song and Fisher (2003) leave
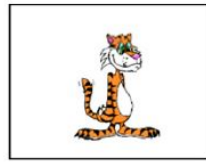
85
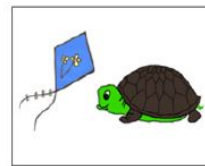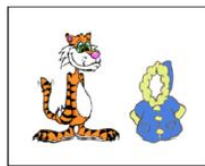
Figure 2.1: Target Video in Song and Fisher 2005,[110]

open the possibility that children do not really understand the salience requirement of the pronoun, but that they look at the protagonist of the story only because their attention was first drawn to that protagonist, no matter which requirements guide the interpretation of the pronoun. In the comprehension study in chapter 4, we will test children's understanding of the salience requirement of pronouns further in ways that avoid this possible confound. Furthermore, given previous evidence reported above, it it surprising that here, 3 year olds are tested for preferential looking and not younger kids, as children start producing pronouns earlier than that. An overall open question here is if children are not only sensitive

to salience when encoutering a pronoun, but if they are also sensitive to uniqueness when encoutering a definite article and if salience and uniqueness influence their behaviour when encountering the respective other construction.

Acquisition of the Definite Article: van Hout et al. (2010,[57]) and Munn et al. (2006,[77])

In the case of definites, studies report considerable flexibility in the production and comprehension of the definite article compared to the indefinite article. Children seem to be overly permissive of using and accepting the definite determiner in contexts where it should be unavailable (cf. studies on the production and comprehension of definites compared to indefinites in e.g. Karmiloff-Smith (1979,[64]), Schaeffer and Matthewson 2005, Schafer and de Villiers (2000,[100]), van Hout et al (2010,[57]), Munn, Miller and Schmitt (2006,[77])). Importantly, children's difficulty mostly arises in cases where they are expected to use the indefinite as opposed to the definite determiner. Children are mostly found to be adult-like in their comprehension and production in those conditions where the definite determiner is indeed required. So their problem might also lie with the indefinite article, which, in its semantic analysis, is often interpreted as a quantifier and thus structurally more complex than the definite article.

To be more specific, I will go into detail about the studies reported in van Hout et al. (2010,[57]) and Munn et al. (2006,[77]). Van Hout et al. (2010, [57]) reports on two experiments of children's production of the definite versus the indefinite article and the comprehension of these phenomena, respectively. Their focus was on testing whether children are sensitive to the familiarity requirement for the definite article and the novelty-condition for the indefinite article, or rather, their theoretical starting point is bidirectional optimality theory, but I will not go into detail about the specific predictions of this theory as it will not be relevant for the purposes of this present dissertation. In both experiments, they also tested adult control groups.

In Experiment 1, children of age 3;1 - 5;8 were presented a verbal short story and were asked to answer a question targeting either a unique or non-unique referent in the story (see example tasks in (118) and (119) below).

(118)   Unique reference:

A dog and a pig were walking over a bridge. Something fell in the water and said "oink!" What was it?

Target Answer: the pig.

(119) Non-Unique reference:

A cat and two birds were sitting in a tree. Something flew out. What was it?

Target Answer: a bird.

Results show that children overuse the definite article in the stories targeting a non-unique referent, while answering targetlike in the case of the unique referent. Adults, on the other hand, behave mostly targetlike in both cases.

In a comprehension task, truth value judgements were elicited by showing children a sequence of two pictures were in the first picture, a unique referent is singled out (i.e. the balloon the father holds in his hand), while other balloons are present in the background in the picture, but not targeted. In the second picture one of the other balloons in the background, i.e. a new referent, flies away. The sequence is accompanied by an explanatory sentence and a question the children are asked to answer (see Figure 2.2 below).
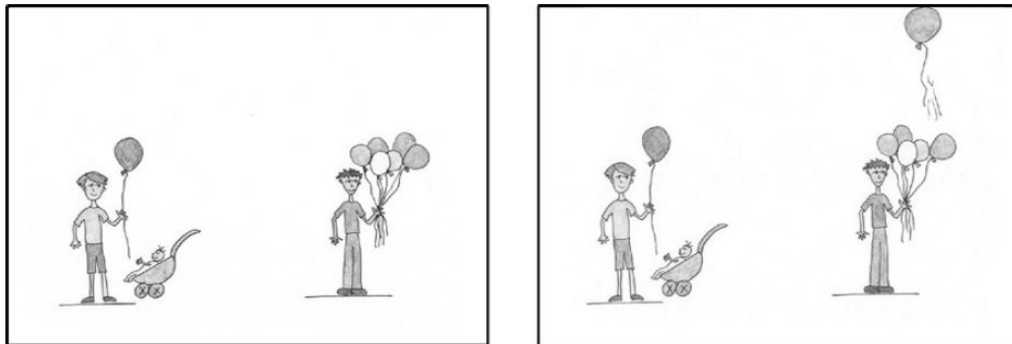
The dad gave the baby a balloon.
Did a balloon fly away? (Target: YES)
Did the balloon fly away? (Target: NO)

Figure 2.2: Target Item in van Hout et al (2010,[57]), experiment 1 (Balloon)

In the question, either the definite or the indefinite article is used. The target answer of the children should be positive when the definite article is used, as the old referent, i.e. the

balloon in the dad's hand, does not fly away. In parallel, the answer should be positive when the indefinite article is used, as indeed the new referent flies away. Here, children give a positive answer when the indefinite article is used, while they still answer positively when the definite article is used, even though it is not the familiar, old referent which flies away. Adults answered mostly targetlike.

In experiment 2, the material was manipulated so that the comprehension and production task would both be accompanied by a visual support. Additionally, all test items were integrated into an ongoing story.

Story: Jimmy's class was going on a picnic! There was lots of food, drink, baskets, silverware and a blanket. They laid something out on the ground for everyone to sit on. When it was all spread out, eveyone sat down on...
Target: the blanket

Figure 2.3: Target Item in van Hout et al (2010,[57]), experiment 2 (Blanket)

For the production task, children were asked to complete the ongoing story, centered around the same protagonist in a sequence of different situations were each time, new objects and individuals are introduced. When the target answer of the children includes the definite article, the previous discourse singles out one specific referent within the story (see Figure 2.3). In the case of the indefinite article, a group of referents is introduced in the previous discourse (see Figure 2.4).

Results reveal that the definite overuse in the context where a non-unique referent is introduced decreases compared to experiment 1. However, adults demonstrate a similar percentage of definite-overuse in the non-unique context, using the definite article in 24 %

Story: Someone had brought juice and paper cups.
Jimmy was thirsty, so he grabbed the juice
and asked someone to pass him...
Target: a cup.

Figure 2.4: Target Item in van Hout et al (2010,[57]), experiment 2 (Papercup)

of cases. Children overuse the definite article in 26 % of cases in the same condition.

Story: Stacey has an orange sweater. She knows that orange is
John's favorite color, so she lets him wear the orange sweater!
Target: (Stacey's) orange sweater

Figure 2.5: Target Item in van Hout et al (2010,[57]), experiment 2 (Sweater)

In the comprehension task, the same basic setup of an ongoing story was preserved, just that this time, children were asked to move one item within the story to match the experimenter's utterance. For example, if a referent is introduced uniquely in the story and

the experimenter uses the definite article, the child should move the old, familiar, referent (see Figure 2.5). When the indefinite article is used, children should not pick the familiar referent, but one of the other referents (see Figure 2.6).

Results line up with experiment 1. Children pick the old referent when hearing a definite article, but still pick the old referent even when hearing the indefinite article at 41 % of cases. These findings suggest that children seem over-permissive with definites. They tend to accept sentences with definites referring to a non familiar referent. An interesting side effect is that in the production task in experiment 2, adults behave nontargetlike to almost the same extent as the children. This finding will become relevant for us and for our experiment later on.
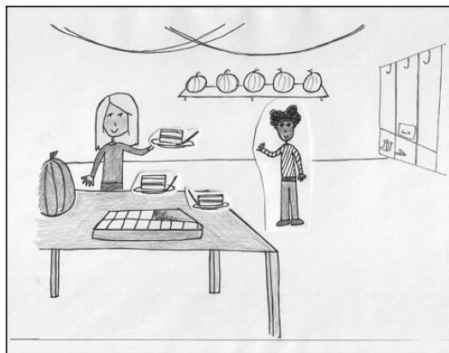
Story: John sees his teacher with a piece of cake. He asks her if
he can have a piece of cake.
Target: one of the other pieces (not the one the teacher is holding).

Figure 2.6: Target Item in van Hout et al (2010,[57]), experiment 2 (Cake)

A possible confounding factor in this experiment is that the mere depiction of, for example the flying balloon in experiment 1, is sufficient to make it familiar. Children zoom in on that part of the scene. Furthermore, a limitation of a truth value judgment task like experiment 1 is that children may want to be charitable and accept a description that is not completely appropriate to make the sentence true. Therefore, in the comprehension study reported in chapter 4, we will use a selection task instead, to probe children's sensitivity to the uniqueness requirement of definites. If children are sensitive to this requirement, the use of a definite should lead them to pick a unique object, in contrast to an indefinite. Regarding the production task, looking at children's spontaneous speech, as is done in

chapter 3, is a necessary addition to the given results as the natural, or unnatural experimental setting might have an effect on children's behaviour.

Munn et al (2006,[77]) zoom in on children's behaviour regarding the definite article by exploring the reason behind children's definite-overuse further. More specifically, two hypotheses are compared. The 'Maximality Hypothesis' and the 'Domain Restriction Hypothesis'. The 'Maximality Hypothesis' tests whether children's definite-overuse is due to a lack of linguistic competence, or in other words, if children have a different analysis for the definite article where uniqueness is not an obligatory requirement. If this were the case, then in cases of the definite article combining with a plural or with a singular should create equally often difficulties in children's behaviour, both in production and comprehension. In the 'Domain Restriction Hypothesis' it is predicted that children have only difficulties with finding the appropriate implicit contextual restriction regarding the definite article in combination with a singular NP complement. Let me illustrate both hypotheses with the help of the target material:

(120)   Target:
        Give me { the frogs/ the frog} next to the barn.

(121)   Control:
        Give me { all the frogs/ a frog} next to the barn.

In an Act Out Task, children are asked to give the experimenter toys. In this setting, there is a house and a barn with three frogs next to each of them and the experimenter uses either of the four commands above. In the target conditions in (120), she uses the definite article with either a plural or singular NP complement. In the case of the plural, children are expected to select the maximal set of frogs which are next to the barn. In the case of the singular, children are required to pick one unique toy with the help of an implicit domain restriction which specifies which unique frog is meant. An adult-like domain restriction targets the frog closest to the barn. If children have difficulty with implicit domain restrictions, they should make non-adult-like choices most often when the definite article combines with a singular NP compared to a combination with the plural NP - as in the plural case, the domain restriction is made explicit by the PP 'next to the barn'. Here, the PP specifies that all frogs next to the barn are targeted. If children have a

different linguistic analysis of the definite, they should behave non-adultlike in both cases, disregarding if the domain restriction is explicitly or implictly given.

The material was tested with English and Spanish children, with a few changes in the Spanish material[41], with an age range from 3;0 to 5;5 (mean age 4;1) for the 15 English children and 3;2 to 4;11 (mean: 4;3) for the 20 Spanish children.

The results show that, whereas children are mostly adult-like in their behaviour regarding the plural, they are less adult-like in the case of the singular. This difference is statistically significant. In other words, when they hear the definite article with a plural NP complement, they most often pick all frogs which are next to the barn, whereas when they hear the definite article with a singular NP complement, they less often pick the frog *closest* to the barn compared to adults. However, an additional test revealed that it does not seem to be the case that they do not consider any domain restriction, but might choose a different one, namely instead of picking the frog closest to the barn, they pick the *first* frog in the row which is next to the barn, counting from left to right where the barn is to the right. The frog in the middle is chosen only seldomnly. The Spanish results furthermore confirm that the maximality effect in the plural condition is not due to a tendendy of the children to choose all the toys next to the barn in all plural cases, disregarding the language input, because in an extra condition with an indefinite plural ('unas gatas' (some cats)), children do not always pick the complete set of cats. It is not clear in the discussion of the results which toy is chosen in the control condition where an indefinite is used - here, they only indicate the percentage of correct responses regarding the number requirement - i.e. that children pick only one toy in the singular case versus more than one toy in the plural case. Consequently, it is not clear if children distinguish between the indefinite and the definite article such that only the latter comes with a requirement of uniqueness (or maximality in this case) and not the former. If we consider the results in van Hout et al. (2010,[57]) again, we see that in those conditions that target the definite article, children are adult-like, whereas in conditions that target the indefinite article, children are non-adult-like. In this study, we do not have a more thorough discussion of the indefinite control condition.

Overall, in Munn et al. (2006,[77]), children are shown to be sensitive to uniqueness/ maximality when hearing the definite article, but how they choose the relevant contextual

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[41]Details about the Spanish material are not relevant for the point made here but can be looked up in Munn et al. (2006).

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restriction that provides uniqueness differs from adult responses. The task here, however, is importantly more complex than in van Hout et al. (2010,[57]). In the singular condition, children have to implicitly infer which characteristics of the referent make it unique - closeness to the barn or being the first item in a row. Thus, the question remains if, in a simpler task that asks for the identification of one clear referent, children are able to pick the unique one. We will see such an experimental setting in the comprehension study in chapter 4.

Correlation of Production of Pronouns and the Definite Article: Koulidobrova (accepted, [66]) and Rozendaal and Baker (2009,[97])

Whereas the previous two sections dealt with pronouns and definites separately, here, the two papers I will discuss in detail compare children's production of pronouns and the definite article directly. Koulidobrova (accepted,[66]) focuses on the syntactic analysis of the phenomena, whereas Rozendaal and Baker (2009,[97]) focus on the pragmatic requirements related to the constructions.

Koulidobrova (accepted,[66]) focuses on the syntactic nature of the definite article, demonstratives and pronouns. Specifically, she hypothesizes that these constructions all occupy the D head. According to the theoretical discussion given above, this is indeed the case irrespective of which interpretation approach, the uniform or classical one, is chosen. For her, this results in the following prediction for the production of the relevant phenomena: the emergence of any of the constructions should predict the emergence of any of the other constructions. Consequently, this hypothesis is weaker than the claim of interdependence tested in this dissertation in the following ways. Rather than finding a correlation of the relevant phenomena (as is the case here), it will be important if the acquisition of the relevant constructions follows a specific order. The syntactic status alone will probably suggest a correlation, but only the semantic-pragmatic analysis will reveal if an order along the lines of the different pathways specified above can be empirically observed. The present dissertation wants to give a more fine-grained analysis of the specific constructions and their order in production and comprehension. Here, it indeed does matter which construction is acquired first. This more fine-grained view on the same kind of data does not contradict Koulidobrova (accepted), as the syntactic position of the constructions are still predicted to sit in the D-head. However, it gives a much more refined picture of what happens within

the D-head. The second hypothesis Koulidobrova suggests picks up this refined research interest to a certain extent. She predicts that the emergence of the definite article specifically will predict the emergence of pronouns and demonstratives - this prediction follows a compositionally driven pathway to a uniform target grammar specified above and indeed directly tackles the more fine-grained issue this dissertation is interested in.

Koulidobrova's study is a production stuy of 10 corpora within the CHILDES corpus. Koulidobrova establishes the age when children start producing the construction in an adult-like fashion followed by frequent use of the construction (the FRU, cf. Snyder (2007,[107])). With a multi regression analysis, she employs a correlation test to see whether first, the emergence of any of the constructions predicts the emergence of the others and secondly, whether the emergence of the definite article predicts the emergence of pronouns and demonstratives in particular. Both tests result in a significant finding, i.e. the ages of first production do indeed correlate and furthermore, the emergence of the definite article predicts the emergence of the other constructions. An additional finding in Koulidobrova is that adult input demonstrates a correlation between adults' use of the definite article and the emergence of pronouns in children's speech. Koulidobrova takes this as an indicator that pronouns receive an analysis as modelled in the uniform view. This ordering, different to the compositionally driven pathway to a uniform grammar, would be more compatible with the contextually driven pathway to a uniform target grammar, where somehow children know that pronouns and definites come with one and the same core compositional analysis but where pronouns are associated with contextually stronger clues, such that they are produced first.

Overall, Koulidobrova serves as a good point of comparison, as she employs a corpus analysis as reported in chapter 3. However, her focus lies on the syntactic status of the phenomena more than the compositional analysis. While the correlation effect of any of the phenomena predicting the emergence of the others is robust, this does not tell us much for the purposes of the specific research questions in this dissertation. The more fine grained correlation between definite article and the other constructions is directly relevant for the present research interest in a possible interdependence of the acquisition of pronouns and definites. However, while on the one hand, the correlation test analysis reveals an ordering that is compatible with a compositionally driven pathway, the correlation with the adult input, such that adult's use of the definite article correlates with children's

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production of pronouns, rather is compatible with the contextually driven pathway - both leading to a uniform grammar. Thus, these results are puzzling in light of the pathways identified in this dissertation. In chapter 3, I will report on a similar, yet different study where a possible recurring pattern of first production of pronouns and definites is tested with a corpus study of 5 English speaking and 5 German speaking children. By using the statistical measure of Binomial Tests, I will compare the age of production of the distinct phenomena within the corpora to see if these result in the same patterns overall. Different from Koulidobrova's analysis, the study in chapter 3 provides a thorough look at each individual corpus to see whether the same ordering of first production can be observed across all corpora - both comparing definites and pronouns and looking within each class. As will be shown, this data does not support such a recurring pattern. Consequently, the results presented in chapter 3 do not align with the results presented in this paper here.

Rozendaal and Baker (2009,[97]) use a corpus study of children's production of definites, indefinites and pronouns, in order to see whether children are sensitive to the distinction between discourse-new and discourse-given referents on the one hand and to the listener's perspective in identifying jointly a referent as new/given on the other hand. Thus, this study nicely complements Koulidobrova's, such that it contributes the focus on the pragmatic meaning components, and to the study reported in chapter 4, where children's comprehension of the pragmatic requirements will be tested, as well as to the study in chapter 3, where also children's production of the phenomena is looked at. Thus, Rozendaal and Baker's paper is an important bridge between the theoretically motivated models for pathways to a target grammar and relevant aspects that I will empirically test both in production and comprehension later on.

In their study, they coded a sample of 600 utterances per child and 300 utterances of the caretakers in three corpora (Adam, Nina and Peter) accessed through the CHILDES database between the ages of 2;0 and 3;3, distributing the data into two data sets at the ages of 2;0 to 2;6 and 2;9 to 3;3 in order to test language development between these two stages. Adult input was taken into account to see whether it could predict children's production.

For testing for the discourse new/given contrast and the listener's perspective, they took the following characteristics of the referents of the constructions into account.

Table 2.14 captures Rozendaal and Baker's definition of the contextual requirements asso-

		Indefinites	Definites	Pronouns
Discourse-New	No Mutual Knowledge	+	-	-
	Mutual Knowledge, physically absent	+	+	-
	Mutual Knowledge, physically present	+	+	+
Discourse-Given	Maintenance	-	-/+	+
	shift	-	+	+

Table 2.14: Typology of Referents according to Rozendaal and Baker (2009,[97]: 1868, Table 1)

ciated with the mapping of the relevant constructions to discourse referents. Indefinites can only tackle discourse-new referents. Rozendaal and Baker further distinguish discourse-new referents in those referents where previous mutual knowledge between speaker and listener exists or not and if this referent is physically present or not. They claim that an indefinite can be used to refer to either of those. In more technical terms, Rozendaal and Baker's classification differs from the classification of contextual requirements in section 2.1 in the following way. All those referents which are identified by Rozendaal and Baker as discourse-new but mutually known by the discourse participants can be classified as weakly familiar according to Roberts (2003,[94]). Those referents which Rozendaal and Baker classify as physically present are called deictic according to Table 2.2 on page 58. Thus, in terms of the system introduced in Table 2.2, the data in Rozendaal and Baker suggests that indefinites can be used to refer to weakly familiar and sometimes deictic referents, whereas pronouns can only refer to weakly familiar and necessarily deictic referents. Definites, in turn can refer to referents that are at least weakly familiar. In other words, the most crucial difference between Rozendaal and Baker's classification and Roberts (2003,[94]) is that weak familiarity is treated as discourse-new in Rozendaal and Baker (2009,[97]) but as discourse-given in Roberts (2003,[94]). In the case of discourse-given referents as defined here, Rozendaal and Baker distinguish between 'maintenance' and 'shift', where maintenance is defined as there being no intervening referent between a previous utterance tackling the same referent and the utterance of the relevant construction

and 'shift' meaning the shift to another discourse-given referent. These terms loosely align to salience, where salience targets the most previously talked about discourse referent. Here, Rozendaal and Baker argue that indefinites cannot be used to refer to any discourse-given referents, whereas pronouns are preferrably used for discourse-given maintenance, and definites for discourse-given shift. Whereas the distinction between given and new in general tackles the question if children are sensitive to this contrast in general, the more fine-grained distinction which takes into account mutual knowledge tackles children's sensitivity to the listener's perspective. In their study, they test for adults' and children's use of the constructions given the distinction in Table 2.14.

Their results demonstrate that adults, as well as children, are sensitive to the given-new contrast (where weak familiarity is treated as discourse new). Whereas adults and children indeed use definites for discourse-new referents, they use indefinites significantly less for discourse-given than for discourse-new referents. The same is the case for children. However, when the listener's perspective is taken into account, it becomes clear that the distinction between genuinely discourse new referents and weakly familiar ones is not as clear for children. Adults do not refer to genuinely new referents in the discourse at all, and they only use indefinites to refer to weakly familiar referents in 13 % of cases, with using 55 % of times a definite article for weakly familiar referents - as is to be expected within the theoretical framework of Table 2.2. Children in the younger age range (2;0 - 2;6) use the indefinite and definite article to the same extent for non-mutual knowledge referents (20 % of the time for each construction). In the later age range, they use the indefinite article more often for non-mutual knowledge discourse referents, but still use the definite article in 15 % of cases. Thus, interpreting these results in light of Roberts (2003,[94]), we see that children do not seem to grasp the difference between novelty and familiarity in the contrast between the definite and indefinite article - as already demonstrated in the studies reported in van Hout et al. (2010,[57]). Regarding pronouns, there is a clear tendency in the adult data for discourse maintenance, and this tendency increases over time in the child data as well. In the later stage (2;9 - 3;3), children are adult-like in their tendency to preferrably use pronouns for discourse-maintained referents. The tendency is already present at the earlier stage, but it is weaker. Although this result is taken by Rozendaal and Baker as indicating that children grasp the new/given contrast earlier in the case of definites than pronouns, I disagree here, as I term weak familiarity as discourse-given - and here, children

have considerable problems distinguishing genuinely new referents from weakly familiar ones in their use of the indefinite and definite article. Secondly, Rozendaal and Baker find that adults, as well as children even at the early stage, use them for discourse-new referents only if these are physically present. This aligns with the theoretical predictions, as physical presence qualifies for salience and at least weak familiarity. Additionally, a side effect of these findings is that it seems to be indeed the case that deixis is a strong clue for children's acquisition of pronouns, as here, in the input and child data, pronouns are most often, almost exclusively, used deictically. However, this raises the question of whether children understand the unique contribution of pronouns or if they only know to produce them purely deictically.

Thus, the general findings of this study are that children seem to grasp a general new/given-contrast, but that regarding the listener's perspective, or, in Roberts' (2003,[94]) terms, weak familiarity, children are still non-adultlike at age 2;9 for the distinction between indefinites and definites. This might also be due to the lack of adult's uses of the indefinite referring to genuinely new referents. In contrast, children from 2;0 on seem to be adult-like in their pronoun use, such that pronouns are preferrably used for discourse-maintained and deictically available referents. Thus, the important take away from this study for the present endeavor is that while children have difficulty with distinguishing between indefinites and definites, their pronouns use is on target at an early age. Also, deixis has been confirmed to play a major role for learning pronouns. The input data analyzed here confirms the three exemplary analyses above and makes a further important point. Maybe the problem of distinguishing between obligatory and optional requirements on the referents can be overcome by observing the distribution and frequency of when a construction cooccurs with the relevant requirements. The obligatory requirements will always cooccur with the relevant constructions, whereas the optional requirements do cooccur only sometimes. This distribution can indeed be observed to a great extent in the input data and can help the children figure out the right analyses of the constructions. A major problem for the data here is that they have not been analysed in terms of uniqueness. Whereas a more detailed picture is shown that gives a classification of strong vs. weak familiarity, it is not clear if uniqueness is always given in the data. The study reported in chapter 4 will add this puzzle piece, alongside the consideration of language comprehension, rather than production. As noted by Rozendaal and Baker, the visual situation could not be reconstructed, as

the corpora only contained audio files. Thus, the act out task in chapter 4 will add control over the visual situation of the child and the experimenter. Thus, the study in chapter 4 is a necessary follow-up on Rozendaal and Baker. Regarding the corpus study in chapter 3, here the focus is a different one. More similar to Koulidobrova, the age of onset of the constructions is looked at and if these follow a recurring pattern of occurence, in light of the different pathways proposed above. Here, age of onset was not considered, but rather children's use right after the constructions come online. Thus, the data here and the data reported in chapter 3 will also rather complement each other than compete.

Summary and Open Questions

Overall, both comprehension and production studies demonstrate children's difficulty with dinstinguishing between the use of indefinites and definites up to 7 years of age. In contrast, children are adult-like in their comprehension and production of pronouns from very early on. They furthermore use pronouns preferrentially for referents which are available in the immediate context, suggesting that the direct context plays a major role on the acquisition of pronouns.

Thus, the picture of acquisiton of pronouns and definites as drawn by these papers is compatible with the pathway to a uniform grammar guided by the direct context (see Figure **??**), but also with the pathway to a classical grammar (see Figure **??**), where the direct context serves as a bootstrap for pronouns, but not for definites. The difference between the two pathways lies in their prediction for the interdependence of pronouns and definites. In the former case, we predict that children should follow the same order of acquisition, both in comprehension and production, while in the latter, we expect there to be possible intervariation as to when individual children learn pronouns or definites. In other words, while it is clear that children fare much better with learning pronouns, it is not clear if this indicates an underlying uniform target grammar or if the acquisition of pronouns and definites is unrelated. Thus, even though the studies discussed here contribute important puzzle pieces to the learner's problem overall, it remains unclear if the acquisition of pronouns depends on that of definites or not. Additionally, the studies did not provide a clear picture of the acquisition process within the two classes of definites and pronouns, as captured by the pathway suggested in Figure **??**. In the studies in chapter 3 and 4, I will tackle this specific question and present first clues for an answer.

Specifically, the production study in chapter 3 will give an indepth picture of children's production of pronouns, definites and demonstratives. Different to Rozendaal and Baker (2009,[97]), I will focus on the determination of the age of onset of production, and not on how they use the constructions after first use. Different from Koulidobrova (acctepted,[66]), I will thoroughly look at each individual corpus and within these corpora, look for an ordering of age of first production and see whether this ordering is the same across all corpora - both comparing definites and pronouns and looking within each class. These results will thus complement Rozendaal and Baker (2009,[97]) and Koulidobrova (accepted,[66]).

In chapter 4, we will test children's comprehension of definites, indefinites and pronouns within one task (different to Song and Fisher (2003,[110], Moyer et al. (2015,[76]), Munn et al. (2006,[77]) and van Hout et al. (2010,[57])), making sure that the task is as natural as possible (in contrast with van Hout et al. (2010,[57]) and in parallel to Moyer et al. (2015,[76]) and Munn et al. (2006,[77])). Importantly, we will concentrate on uniqueness (different to Rozendaal and Baker (2009,[97])) and salience, such that salience has to be mapped to the linguistic input (in contrast to Song and Fisher (2003,[110])).

2.3   Guiding Research Questions

Coming back to the general research questions in chapter 1 in (1) and (2), page 2, about the interplay of linguistic theory and empirical evidence, the previous sections have guided the way to specifying these in light of which different versions there are of a possible target grammar and how different pathways to these might look like in language development, captured in the research questions (122),(123) and (124).

(122)   Is the interpretation of pronouns dependent on the interpretation of definites?

(123)   Does the acquisition of pronouns depend on the acquistion of definites or vice versa?

(124)   How does the acquisition of the presuppositions of pronouns and definites proceed?

This chapter has already given first ideas of how to answer these questions. Specifically, formulating the target grammar naturally provides answers to (122), whereas defining pos-

sible pathways to the target grammar (see Section 2.2.3 on page 72) tackles research question (123). (122) targets how a target grammar can be modelled in the first place. Here, the uniform view models the analysis of pronouns and definites as dependent on each other, the classical view does not. The respective lack or existence of interdependence has an impact on different pathways and thus influences research question (123). Previous research has contributed some first angles to an answer, but still is unclear regarding the specific claim made by the uniform view. Consequently, the aim of the empirical part of this dissertation, and especially chapter 3, is to see whether a recurring pattern of when the constructions are first produced can be observed across corpora, by looking at the comparison between definites and pronouns. In addition, chapter 3 will provide evidence for research question (124). This research question complements research question (123), as it concentrates on the internal pragmatic analysis of definites and pronouns, respectively. Here, I will investigate how the presuppositions of pronouns and definites are acquired. To closely pay attention to the the individual presuppositions associated with pronouns and definites will provide a glance through the magnifying glass which will contribute to a better understanding of the two classes. To that end, Chapter 4 will be most closely concerned with this question. Chapter 3 and 4 will introduce specific hypotheses that will serve as a testing points for answering these questions.

Chapter 3

Children's Production of Pronouns and Definites

In the previous chapter, I have introduced two versions of a target grammar and possible pathways of acquiring these different versions. The basic claim that is able to distinguish between the uniform and classical grammar concerns **dependence**. Only in the uniform view, the compositional analysis of definites and pronouns is captured by the same mechanism, not so in the classical view.

To recapitulate, in the classical view, pronouns are analyzed as variables, the definite article is analyzed as a presupposition trigger operating on an NP complement. In the uniform view, both pronouns and definite article are analyzed as presupposition triggers with an NP complement. However, the NP complement is covert in the case of pronouns. Thus, the main difference between the two views lies in the claim of the uniform view that definites and pronouns are analysed in parallel.

In this chapter, I will test this claim of dependence, which has been formulated previously as one of the main research questions guiding this dissertation (and is repeated in (125) below), by considering children's language production as documented in the CHILDES database in corpora collecting children's spontaneous speech[1].

Additionally, the corpus data will contribute to research question (126) by providing information about the time course of first production within the class of pronouns and definites, respectively.

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[1]Section 3.2.2 has been previously published in Brockmann (2017,[11]).

(125) Does the acquisition of pronouns depend on the acquistion of definites or vice versa?

(126) How does the acquisition of the presuppositions of pronouns and definites proceed?

In the following section, I will go into detail as to how language production can serve as an empirical source for this research question and which concrete hypotheses arise. In section 3.2, I will introduce a study on English children's production of definites and pronouns. A point of comparison will be introduced in section 3.3, where a second corpus study on the production of German-learning children is considered, using the CHILDES database. German serves as a good additional source, because here, the target grammar demonstrates a more refined picture than in English considering further distinctions within the classes of pronouns and definites.

3.1 Testing Language Production

So how can (125) be tested with production data? Or, in other words, can production data make claims about children's underlying compositional analysis of the phenomena in the first place? Only if this is the case can (125) be tested here, as this research question necessarily follows from how the target grammar - and here especially considering the compositional meaning component - has been defined.

As a working assumption, I will for now say that the answer should be yes - children's production indeed mirrors children's analysis of the relevant phenomena. In assuming that this is the case, I follow Snyder (2007,[107]), who claims that children are **conservative** in their production, i.e. children only start to produce a construction when they've fully understood and have been able to interpret the grammatical basis of the construction (see Snyder (2007,[107]:73) and the definition given below).

(127) **Grammatical Conservatism (GC)**: Children do not make productive, spontaneous use of a new syntactic structure until they have both determined that the structure is permitted in the adult language, and identified the adults' grammatical basis for it. (Snyder (2011,[108]:2))

Snyder (2007,[107]) argues that for example children's lack of significant errors in their language use suggests that conservativity is at play. Those errors that do occur in children's speech are more often errors of omission rather than errors where a construction is plainly used wrongly. In Snyder (2011,[108]), he gives further evidence to support this claim. However, a question immediately arises for the purposes of this dissertation. The definition of GC above only concerns children's syntactic analysis. The interdependence put forward by the uniform view concerns syntax and semantics and necessarily includes the integration of both components. So can we make use of conservativity at all? I will argue that we can indeed. Firstly, the basis of the uniform view is in fact syntactic. Pronouns, in parallel to definites, are analysed syntactically in combination with an NP complement as an argument. The presence of this NP complement is a syntactic claim. Also, the analysis of indexical pronouns in terms of the uniform view makes syntactic claims about the presence of a complex argument for the indexical, a relation and an index. Both have been analysed as being covertly part of the syntax. So indeed - if children are at least syntactically conservative, we should observe a recurring pattern of production if the uniform view is the target grammar. Moreover, in the case of both the uniform and classical view, the syntactic and semantic analyses are interdependent and connected via their composition and via the definition of - az least definites, and also pronouns in the uniform view - as functions. A semantic analysis of 'the' necessarily requires a suitable argument, which has to be syntactically and semantically suitable. This argument has to be provided syntactically - only then can a compositional analysis of the DP as a whole proceed. Thus, in our case, we cannot really separate the two components. Instead, they interact. Or in other words: definites and pronouns are closer to the functional domain of compositional meaning, contrary to nouns, which are content words. To illustrate, while the compositional role of a noun might not be very complex, its meaning in terms of its defining characteristic might well be. On the other hand, pronouns and definites do not come with rich content, but with rich composition, and are thus expected to be learned conservatively. Secondly, as already stated in chapter 2 above, Roeper (2004,[95]) gives evidence that from very early on, i.e. when children start encountering and analysing hierarchical structures, they begin to compositionally interpret them. I take these two arguments as sufficient for now to make use of GC for the present purposes. In other words, production (and here, Snyder (2011,[108]) means children's spontaneous speech more specifically) can provide insights

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for (125).

If we assume that GC holds for our data, two additional predictions for language development follow which directly influence how interdependence can be tested. Although Snyder (2007,[107]) formulates these predictions in terms of parametric hypotheses, I will use them for my present purposes. Even though I am not concerned with parametric development here, still the logic of the comparison of two available constructions within a language holds in our case. If there is interdependence between two constructions regarding their grammatical structure, this interdependence will be reflected in their acquisition. The Assumption of Concurring acquisition in (128) states that if the grammatical 'ingredients' of one construction are the same for another construction, then these two constructions should be acquired simultaneously. Ordered acquisition in (129) says, in turn, that if a construction shares some grammatical ingredients with another construction, but the latter demonstrates some additional ones not inherent to the first construction, then the second construction should not be acquired significantly earlier than the first construction. Taken together with conservativity, these predictions carry over to language production. Regarding the relation of definites and pronouns, I formulate my hypothesis by following the prediction of 'ordered acquisition' in (129).

(128)   **Concurring Acquisition**: grammatical knowledge (including parameter settings and lexical information) for construction **A** = knowledge required for construction **B** → Age of Acquistion (AoA) of A = Age of Acquisition (AoA) of B

(129)   **Ordered Acquisition**: grammatical knowledge (including parameter settings and lexical information) for construction **A** ⊂ knowledge required for construction **B** → AoA A ≤ AoA B
        (No child should acquire B significantly earlier than A.)
        (cf. Snyder (2007,[107]: 7, examples (1) and (2))

I will introduce now specific claims about a pattern observable in production. In chapter 2, I have identified two pathways to a uniform and classical target grammar. These pathways can be directly translated into hypotheses that guide the order of when children start producing definites and pronouns.

For the uniform view, I have identified two versions of a possible pathway in chapter 2, section 2.2.3 on page 77. In the contextually drive pathway, the driving force of chil-

dren's language production is presumed to be the contextual information available to the child.In the alternative pathway which is guided by composition, the main driving force for children's production of definites and pronouns is children's growing sensitivity to the composition. In light of GC, both versions are equally plausible. The contextually guided pathway requires that children have already understood the underlying compositional analysis and are now concerned with combining it with the information given in the context - this underlying understanding of the compositional component is assumed in GC anyways, as children are claimed to start using a construction only after having assigned it an analysis. However, the compositionally driven pathway is also plausible, as it could be argued that compositional development is more relevant in the specific time frame when definites and pronouns are acquired. The most explicit compositional analysis is the one of the definite article, as all meaning components are overtly given in the DP structure. The compositional analyses of pronouns require additional syntactic components that are furthermore only covertly given.

On the basis of these pathways, I formulate the hypothesis for language production in Table 3.1. Table 3.1 captures two possible patterns. Either the definite article is produced before (guided 'bottom up' by the underlying composition, abbreviated as UV-CTX) or after (guided 'top down' by the direct context, abbreviated as UV-COMP) the other phenomena (see chapter 2, section 2.2.3, page 72 for more details about the derivation of these two pathways). Both versions require that such a pattern can be observed across all available corpora, i.e. the different versions exclude each other. Either all corpora reveal an ordering following the influence of the context or all corpora reveal an ordering following the composition.

The pathway identified for a classical target grammar differs from the other insofar as here, no dependence between pronouns and definites is predicted. In terms of a classical target grammar, we do not know in which order definites and pronouns could possibly be produced, as the mechanisms that drive production are independent from each other. Thus, here, no hypothesis follows. Instead, a classical target grammar is more compatible with a possible finding of **intervariation** across production orderings in the corpora, but is also compatible with a constant pattern, because dependence could be established by other means. Intervariation as a possible finding is harder to integrate into any of the proposed patterns of the uniform view. Thus, the following corpus studies will test (3.1).

The production of the definite article, indexical and third person pronouns and demonstratives demonstrates the same **pattern** observable across corpora such that *either*

(a) **Context (CTX)**: pronouns (indexical and third person) and demonstratives are not produced significantly later than the definite article.
{ PRO, IDX, DEM } ≤ DEF
or
(b) **Composition (COMP)**: the definite article is not produced significantly later than third person pronouns, indexical pronouns or demonstratives.
DEF ≤ { PRO, IDX, DEM }

Table 3.1: The Uniform View Hypothesis (UVH)

Consequences for the classical view will follow indirectly.

The last stage of acquisition (see the discussion in section 2.2.3 on page 81), requires special attention. As stated in chapter 2, section 2.2.3, the acquisition process for definites and pronouns is only completed once all the additional pragmatic requirements within pronouns and definites, respectively, have been acquired. Whereas all pronouns require salience, individual pronouns differ in which ϕ-features they select. Therefore, the question for this production study arises if children's production will reveal an observable pattern for the order of first production within pronouns and definites regarding their ϕ-features. 'He' and 'she' need the additional ϕ-feature of gender and thus are structurally more complex than 'it'[2]. Thus, these should not precede 'it' in age of first production. Likewise for definites. The demonstratives 'this' and 'that' are structurally more complex and should thus not precede the definite article. As we can think about ϕ-features as being stacked on top of each other in the DP structure, I call this hypothesis the 'Additivity Hypothesis', see Table 3.2.

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[2]The investigation of ϕ-features is by far not exhaustive here. In this study here, I will exclude plural pronouns and case-marked pronouns. The exemplary discussion of 'he', 'she' and 'it' will suffice to show first evidence of the viability of a hypothesis as in Table 3.2. I leave it to future studies to see whether such a pattern can be observed when considering plural and case-marked pronouns.

The first production of 'it' is not significantly later than the first production of 'he' or 'she'.
$it \leq \{\ he,\ she\ \}$
The first production of 'the' is not significantly later than the first production of 'this' or 'that'.
$the \leq \{\ this,\ that\ \}$

<div align="center">Table 3.2: The Additivity Hypothesis (AH)</div>

3.2 Corpus Study on the Production of Pronouns and Definites in English

In this section, I will report on a study on the production of pronouns and definites of monolingually English speaking children. As described in section 3.1 above, this study will provide evidence for testing the UVH in Table 3.1 and the Additivity Hypothesis in Table 3.2. I start with this study, as it provides evidence concerning the language that has been the object language in almost all of the theoretical accounts considered in chapter 2 - English.

First, a detailed description of the corpora used and the resulting probability of a significant result will be calculated. On the basis of this information, a first important step is to establish the exact point in time when children reliably start producing the relevant constructions. After statistically testing whether there are recurring orderings of the constructions and the discussion of the results of this analysis, adult input as an alternative predictor for the data has to be taken into account. There will be a short excursus on an interesting error type. In the end, an overall discussion follows.

3.2.1 Corpora

The basis for the corpus study are five longitudinal corpora available in the CHILDES database (MacWhinney 2000,[72]). I collected and analysed the corpora manually in a timeframe from first use to the age where the last of the constructions was produced, searching for all relevant uses by the children of third person pronouns, indexical pro-

nouns, demonstratives and the definite article with the search tool CLAN. I will specify how I coded the search results in the next section. Start and ending of the recordings as well as the mean recording rate per month, the total number of utterances and transcripts are specified for each corpus in Table 3.3 below.

Child	First Recording	Last Recording	Mean Recording Rate (Per Month)	Total # of Utterances	Total # of Transcripts
Naima	0;11	3;10	2,93	24170	83
Lily	1;1	4;0	2,35	23619	80
Naomi	1;2	4;9	4,04	15523	93
Mark	0;10	5;6	3,96	15919	210
Violet	1;2	3;11	1,92	8309	54

Table 3.3: Information on the Corpora Used

Coding

Utterances were coded according to adult-like and independent usage, excluding imitations, repetitions or routine utterances (cf. Snyder (2007,[107]). For that reason, two student assistants[3] and I coded the search results manually. We systematically labelled erroneous utterances as well. The generic reading of 'you', 'that' as a clausal complementizer, as well as the expletive usage of 'it' were also coded and excluded from analysis.
In the time frame from first use that we could identify as adult-like and independent to confidently identifying the first among frequently repeated uses of each construction (the FRU, see Snyder (2007,[107]))[4], we took an even closer look at the utterances. For each utterance, we reconstructed the discourse context as accurately as possible and named the specific referent for the pronoun or article used. We also coded for these utterances if the referent was within the direct discourse context of the child (coded as 'dc' for direct

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[3]Here, I would like to thank Nina Fritz and Julia Chant!

[4]I took two measures into account for establishing the FRU: first, the increase of uses of the constructions as observable in the immediately following two months and second, a qualitative analysis of the immediately following utterances. If more than five of them were independently used, adult-like and a referent could be easily established, then the first among them was taken as FRU.

context) or within a story the child was reading or telling (coded as 's' for story), or was an abstract referent (coded 'a'). With these two additions to coding, adding the identification of the referent and its discourse role, we made sure that the utterances of the children were really adult-like and appropriate within the context. In Table 3.4 below, I summarize our findings for the distribution of the type of referent within the first uses of each child.

Corpus	Direct Context	Story Context	Abstract Referent	Total
Lily	83	31	2	116
Naima	91	41	0	132
Naomi	110	13	0	123
Violet	114	33	1	148
Mark	113	25	7	145
Total	511	143	10	664
Percentages	77%	22%	1%	

Table 3.4: Type of Referents

As can be seen in Table 3.4, all children referred mostly to the direct discourse context (at 77 % of times) and only sometimes referred to referents within a story context (at 22 % of times). They almost never referred to abstract referents (only at 1% of times). Even though we can still not be entirely sure that the referents the children refer to meet the additional contextual requirements of salience and uniqueness, the three step method of 1) identifying the utterance as independent and adult-like from a purely semantic point 2) checking the context for a suitable referent and 3) coding for the type of referent used is as thorough as we could get for the purpose of this study.

Probability of a Recurring Pattern of First Production

Throughout this study, I define findings supporting the hypotheses in Table 3.1 as observing orderings which align to either the primary influence of the composition on the order of when the constructions are first produced (UVH-COMP) or a contextually driven order (UVH-CTX) across all five corpora. The constructions considered here are demonstratives ('Dem'), third person pronouns ('Pr'), indexical pronouns ('Ix') and the definite article ('Def'). In other words, orderings compatible with UVH-COMP are those orderings where the definite article is not produced significantly later than any of the other

constructions. These are given on the left side of Table 3.5 below. Out of a total number of 15 possible orderings of the four phenomena, 8 are compatible with UVH-COMP. On the right hand side, all orderings are given that are compatible with UVH-CTX - as these mirror the orderings for UVH-COMP, we arrive at the same number. Note that both patterns, UVH-COMP and UVH-CTX, exclude each other. Either, all corpora follow patterns going along the compositional route or all corpora follow the contextual route. In other words, there should be no intervariation between observed orderings according to both hypotheses.

Orderings Compatible with UVH-COMP	Orderings Compatible with UVH-CTX
{Dem, Pr, Def} < Ix	Ix < {Dem, Pr, Def}
{Def, Ix, Pr} < Dem	Dem < {Ix, Pr, Def}
{Def, Dem, Ix} < Pr	Pr < {Ix, Dem, Def}
{Dem, Def} < {Pr, Ix}	{Pr, Ix} < {Dem, Def}
{Pr, Def} < {Dem, Ix}	{Dem, Ix} < {Pr, Def}
{Def, Ix} < {Dem, Pr}	{Dem, Pr} <{Ix, Def}
Def < {Dem, Pr, Ix}	{Dem, Ix, Pr} < Def
{Def, Dem, Ix, Pr}	{Def, Dem, Ix, Pr}[5]

Table 3.5: Possible Orderings

However, before seeing whether the corpora demonstrate either orderings compatible with the UVH-COMP or UVH-CTX, respectively, an important pretest is to see whether the probability of such a finding would be different from chance, i.e. given that all orderings are equally likely, how likely is it to find orderings only compatible with either hypothesis in all five corpora? As is shown in (130), both possible outcomes of finding exclusively orderings compatible with one or the other version of the UVH is significant in both cases and could thus strongly support the UVH if we found such an exclusive pattern in the data[6].

(130)   Probability compatible with UVH-COMP/ UVH-CTX observed across 5 corpora:
        $p = (8/15)^5 = 0.043*$

All orderings are compatible with the classical view. Only the lack of a clear pattern, i.e.

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[6]Significance here is defined as a p-value under 0.05.

intervariation of orderings on the right and left side in Table 3.5, speaks against the UVH and could thus be taken as supporting the classical view.

We can employ the same test for the Additivity Hypothesis, by calculating whether finding orderings compatible with it within the groups of pronouns and definites is significantly different from the chance level. As we can see in (131) and (132), such a finding would only be significant in the case of definites. Nonetheless, the probability of finding orderings compatible with the AH in the case of pronouns is close to being significant. Still, these data require more backup in future studies.

(131)   Probability compatible with AH for pronouns observed across 5 corpora: $(4/7)^5 =$ 0.061

(132)   Probability compatbile with AH for definites observed across 5 corpora: $(1/2)^5 =$ 0.031*

3.2.2 Results

Age of First Production

As a first step, I determined the Age of First Production (AFP). This measure is used for the statistical analyses below. The AFP was determined by identifying the first of the utterances of the phenomenon that was soon followed by regular use (see Snyder (2007,[107])) within the individual transcripts[7]. Age in months and individual transcripts are given in Table 3.6 below. Here, only those constructions are included that were produced first among the four groups of phenomena (third person pronouns, indexical pronouns, demonstratives and the definite article). For every corpus, the same construction within the groups was produced first: 'I', 'it', 'this' and 'the'. See Appendix A for a complete list of the AFP of all constructions considered in Table A.1 on page 191, as well as the raw number of tokens for the relevant constructions given in Table A.2 on page 191, graphs of Production

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[7]The soon following regular use is illustrated in the graphs on Production Development in the Appendix A, page 192. The Lily-, Naima-, Naomi- and Violet-Corpus show that usually, once a construction is learnt and firstly produced, its production escalates quickly. For example, in the Lily-Corpus, use of 'this' rises from the FRU at age 1;10 to a permille rate of above 350 (i.e. the ratio of utterances of the relevant constructions within 1000 utterances) within 6 months. The Production Development of Mark demonstrates that here, errors in transcription likely interfered - this is why here, an untypical pattern of Production Development is observed, not with an exponential rise, but with many ups and downs in production.

Development on page 192, as well as a list of the relevant first utterances on page 187 and following pages.

The overall AFP range of all phenomena taken together is from 1;4 in the Naima Corpus to 2;6 in the Mark Corpus. However, if we look at the corpora individually, we see that all four constructions are produced within a very short time frame of one to three months in sequence. The only outlier here is the Mark corpus. This almost simultaneous start in frequent use of all constructions is striking. However, a more thorough look is necessary to see whether we find fine-grained orderings compatible with either of the two versions of the UVH.

	Lily	Naomi	Naima	Mark	Violet
I	1;10(lil21)	1;10(n09)	1;5(nai16)	1;5(38b2)	1;8(vio14)
it	1;11(lil24)	1;10(n09)	1;6(nai18)	1;8(43a2)	1;9(vio16)
the	1;10(lil22)	1;10(n14)	1;4(nai11)	2;6(52a2)	1;9(vio16)
this	1;10(lil21)	1;10(n15)	1;5(nai17)	2;4(49a2)	1;9(vio15)

Table 3.6: Age of First Production (AFP)

When we take a closer look at the AFP within pronouns and definites, we can see in Table 3.7 that 'the' and 'this' are first produced within the same month in the Lily-, Naomi- and Violet-Corpus, whereas the demonstrative 'this' follows 'the' by a month in the Naima-Corpus. The only outlier is the Mark-Corpus, where 'this' precedes 'the'. The Binomial Tests below will reveal if any of these orderings turn out to be significant.

	Lily	Naomi	Naima	Mark	Violet
the	1;10(lil22)	1;10(n14)	1;4(nai11)	2;6(52a2)	1;9(vio16)
this	1;10(lil21)	1;10(n15)	1;5(nai17)	2;4(49a2)	1;9(vio15)
that	2;0(lil27)	1;10(n20)	1;6(nai19)	2;6(52a1)	1;10(vio17)

Table 3.7: Age of First Production (AFP): Definites

In the case of pronouns, Table 3.8 illustrates that 'it' precedes 'he' and 'she' in all corpora, except the Lily-Corpus, where 'it' and 'he' are first produced within the same month. Again, the Binomial Test below will reveal if these orderings are significant.

However, the raw data presented here already demonstrate that in the case of pronouns, the Additivity Hypothesis is borne out. In all corpora, 'it' does not follow 'he' or 'she'.

	Lily	Naomi	Naima	Mark	Violet
it	1;11(lil24)	1;10(n09)	1;6(nai18)	1;8(43a2)	1;9(vio16)
he	1;11(lil23)	1;11(n23)	1;8(nai28)	2;1(47b1)	2;0(vio22)
she	2;2(lil34)	2;5(n62)	1;7(nai23)	3;0(56a1)	2;3(vio26)

Table 3.8: Age of First Production (AFP): Pronouns

The same can be said about definites. 'The' is not produced later than any demonstrative, with the exception of the Mark-corpus. In other words, even if we will find that some of the orderings turn out to be significant, these will all be orderings compatible with the AH.

Analysis on the Basis of Months (Brockmann (2017,[11])): Comparing Definites and Pronouns

In accordance with Snyder (2007,[107]) and Stromswold (1996,[112]), in Brockmann (2017,[11]), I employed a nonparametric statistical test that checks significance of one construction being produced before another construction. I employed the test within corpora, and, as a first step, only for differences in production age on the basis of months. I will show how these tests can be employed on the basis of transcripts in the next section. The rationale behind this so called 'Binomial Test' is to see how unlikely the difference between actual observed age of production and expected age of production of the later construction is, given the relative frequency of both constructions once they are produced on a regular basis. The reasoning behind considering relative frequency is to see whether the observation in the production data could be explained by frequency alone. If two constructions are used equally often, i.e. if their frequency is the same, then, on the pure basis of frequency, they should be firstly produced at the same time. However, if we observe that one of the constructions precedes the other in production, then the observation deviates from the expectation based on frequency. A different reason has to be found for the deviance - and in our case, the linguistic analysis of the relevant construction is posited as the reason. These tests were only conducted for orderings were a difference could be observed.

All of the binary tests taken together then reveal one of the fifteen possible orderings for

one corpus. If all five corpora demonstrate the same pattern of ordering on the basis of these individual Binomial Tests, this will in total contribute to the validity of the results of this study as discussed in section 3.2.1 above. On the basis of age of production determined in months, the Naomi Corpus will be excluded from statistical analysis, as all four phenomena are produced within the same month.

The following tables demonstrate the results of the statistical analysis and are ordered as follows. Construction 1 in each case is this construction where earlier occurrences in comparison to construction 2 have been found. The number of earlier occurrences of construction 1 is given in the third column. The relative frequencies of construction 1 and construction 2 are given in the fourth and fifth column, respectively. As a result of these data, the sixth column represents the p-value, i.e. the probability of finding earlier occurrences of construction 1, given the relative frequencies.

Construction 1	Construction 2	# of Earlier Occurences of Constr. 1	Relative Frequency 1	Relative Frequency 2	P-Value
I	it	14	0.72	0.28	0.073
the	it	2	0.58	0.42	0.221
this	it	6	0.37	0.63	0.0003***

Table 3.9: Binomial Test: Lily Corpus (Months)

Construction 1	Construction 2	# of Earlier Occurences of Constr. 1	Relative Frequency 1	Relative Frequency 2	P-Value
the	I	4	0.93	0.07	0.4
the	it	5	0.64	0.36	<0.001***
this	it	10	0.15	0.85	<0.001***
the	this	4	0.91	0.09	0.254

Table 3.10: Binomial Test: Naima Corpus (Months)

The only significant ordering in the Lily Corpus is that the demonstrative 'this' significantly precedes 'it' (see Table 3.9). In the Naima Corpus, both 'the' and 'this' precede 'it' significantly. 'The' preceding 'I' and 'this' did not turn out to be significant (see Table

3.10). None of the orderings within the Violet Corpus turned out to be significant (see Table 3.11).

Construction 1	Construction 2	# of Earlier Occurences of Constr. 1	Relative Frequency 1	Relative Frequency 2	P-Value
I	it	4	0.68	0.32	0.145
I	the	4	0.60	0.40	0.078
I	this	4	0.87	0.13	0.24

Table 3.11: Binomial Test: Violet Corpus (Months)

All previously mentioned corpora have demonstrated orderings that are compatible with the UVH-COMP. Lily only shows significant orderings regarding 'it' following 'this' and 'I'. Also, the Naima Corpus only demonstrates a significant ordering between 'the' and 'this' and 'it'. The Violet Corpus did not show any significant ordering, neither did the Naomi Corpus, in which all phenomena were produced first within the same month. However, the Mark Corpus reveals evidence compatible with UVH-CTX (see Table 3.12), as has been already observable in the raw data in Table 3.6.

Construction 1	Construction 2	# of Earlier Occurences of Constr. 1	Relative Frequency 1	Relative Frequency 2	P-Value
I	it	3	0.73	0.27	0.295
I	the	44	0.59	0.417	<0.001***
it	the	5	0.21	0.79	<0.001***
this	the	2	0.07	0.93	0.01***
I	this	24	0.95	0.05	0.026*
it	this	3	0.78	0.22	0.168

Table 3.12: Binomial Test: Mark Corpus (Months)

All of the results work equally well with the classical view, because it does not make any predictions about expected orderings.

Altogether, we see that no overall observable recurring pattern is found. However, the reason might just be that measuring the time course of language development in months is not fine-grained enough. This is why, in the following section, I will once more analyse

Construction 1	Construction 2	# of Earlier Occurences of Constr. 1	Relative Frequency 1	Relative Frequency 2	P-Value
I	the	7	0.655	0.345	0.051*
the	it	7	0.568	0.432	0.019*

Table 3.13: Binomial Test: Lily Corpus (Transcripts)

the data, but on the basis of sequence of transcripts, not of months. This enables the analysis to look into the time frame of development in weeks as most of the corpora have a mean recording rate of at least 2 recordings per month. Another advantage of refining the analysis is the possibility of including the Naomi Corpus which has been excluded exactly because all constructions were first produced within the same month. However, within this month, recording was very dense and included 12 transcripts.

Analysis on the basis of transcripts: Comparing Definites and Pronouns

In the following, the results of the Binomial Test, this time on the basis of transcripts, are given for each corpus and each pair of constructions where a difference in transcripts could be observed.

Construction 1	Construction 2	# of Earlier Occurences of Constr. 1	Relative Frequency 1	Relative Frequency 2	P-Value
the	I	14	0.932	0.068	0.362
the	it	21	0.648	0.352	<0.001***
the	this	21	0.912	0.088	0.141

Table 3.14: Binomial Test: Naima Corpus (Transcripts)

In contrast to the analysis on the basis of months above, we see some changes. In the Lily Corpus, 'the' preceding 'it' turns out to be significant (see Table 3.13). In the Naima and Mark Corpus, the same orderings are significant as in the previous analyses (see Table 3.14 and Table 3.16). In the Violet Corpus, 'this' significantly precedes 'the', an ordering

not found in the previous analysis (see Table 3.15). In the Naomi Corpus, which has only now been taken into consideration, 'I' significantly precedes 'the' (see Table 3.17).

Construction 1	Construction 2	# of Earlier Occurences of Constr. 1	Relative Frequency 1	Relative Frequency 2	P-Value
I	the	3	0.603	0.397	0.219
this	the	5	0.391	0.609	0.009**

Table 3.15: Binomial Test: Violet Corpus (Transcripts)

Construction 1	Construction 2	# of Earlier Occurences of Constr. 1	Relative Frequency 1	Relative Frequency 2	P-Value
I	the	54	0.583	0.417	<0.001***
it	the	9	0.204	0.796	<0.001***
this	the	2	0.101	0.899	0.01***

Table 3.16: Binomial Test:Mark Corpus (Transcript)

Even more than the analysis above, the present analysis demonstrates considerable inter-variation of when an ordering turns out to be significant. In the Naima corpus, we observe one significant ordering compatible with the UVH-COMP. The definite article 'the' is produced significantly before 'it'. However, the other four corpora all partly demonstrate orderings where the definite article is produced significantly later than the other constructions, following UVH-CTX. These orderings are significant in the Violet, Mark and Naomi Corpus. We see thus that there is not one recurring pattern of an ordering observable across all five corpora. Instead, the Naima corpus shows significant orderings compatible with the UVH-COMP, the other corpora partly demonstrate orderings compatible with the UVH-CTX and partly orderings compatible with the UVH-COMP (see for example the Lily-corpus).

Analysis of the AFP within each group, Definites and Pronouns

The identification of the AFP has revealed that within pronouns and definites, respectively, we do not observe orderings that are incompatible with the Additivity Hypothesis, except

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Construction 1	Construction 2	# of Earlier Occurences of Constr. 1	Relative Frequency 1	Relative Frequency 2	P-Value
I	the	18	0.777	0.223	0.01**

Table 3.17: Binomial Test: Naomi Corpus (Transcripts)

for the Mark-Corpus. However, the Binomial Tests used for the comparison between definites and pronouns above to test the UVH can also be employed to see whether the orderings within pronouns and definites turn out to be significant. And indeed, as the individual corpora show, we see that significant orderings can be observed. Interestingly, these significant orderings come about not only because 'it' is first produced earlier, but also because throughout the corpora, 'it' is used more frequently than the other pronouns. The high frequency of 'it' compared to the other pronouns can be observed across all five corpora (see the fourth column in the tables below).

Construction 1	Construction 2	# of Earlier Occurences of Constr. 1	Relative Frequency 1	Relative Frequency 2	P-Value
it	she	71	0.91	0.09	0.001***
the	that	83	0.82	0.18	<0.001***

Table 3.18: Binomial Test: Lily Corpus (Transcripts): Additivity

Construction 1	Construction 2	# of Earlier Occurences of Constr. 1	Relative Frequency 1	Relative Frequency 2	P-Value
it	he	145	0.86	0.14	<0.001***
it	she	67	0.73	0.27	<0.001***
the	that	42	0.75	0.25	<0.001***

Table 3.19: Binomial Test: Naima Corpus (Transcripts): Additivity

In all corpora except the Violet Corpus (see Table 3.21), 'it' significantly precedes 'she'. However, in the Violet Corpus, this ordering does not come out as significant, as the rel-

ative frequency and the number of earlier occurences of 'it' are already very high, so that finding 94 utterances of 'it' before 'she' is not unlikely. We can see thus that in this case, the Binomial Test is not able to capture that it is not only the case that 'it' precedes 'she', but that this ordering is even highly likely.

Construction 1	Construction 2	# of Earlier Occurences of Constr. 1	Relative Frequency 1	Relative Frequency 2	P-Value
it	he	58	0.93	0.07	0.015*
it	she	290	0.90	0.10	<0.001***
the	that	10	0.65	0.35	0.013*

Table 3.20: Binomial Test: Naomi Corpus (Transcripts): Additivity

Construction 1	Construction 2	# of Earlier Occurences of Constr. 1	Relative Frequency 1	Relative Frequency 2	P-Value
it	he	28	0.78	0.22	0.001**
it	she	94	0.98	0.02	0.15

Table 3.21: Binomial Test: Violet Corpus (Transcripts): Additivity

Similarly, in the Naima Corpus (see Table 3.19), the Violet Corpus (see Table 3.21) and in the Naomi Corpus (see Table 3.20), 'it' significantly precedes 'he'. In each case, the relative frequency of 'it' is high.

Construction 1	Construction 2	# of Earlier Occurences of Constr. 1	Relative Frequency 1	Relative Frequency 2	P-Value
it	she	12	0.85	0.15	0.001**

Table 3.22: Binomial Test: Mark Corpus (Transcripts): Additivity

In the case of definites, the comparison between 'the' and 'this' was already tested in the two previous sections. In the Mark and Violet Corpora, the orderings suggested that 'this' significantly precedes 'the' (see Table 3.15 and Table 3.16 in the previous section). These

orderings are incompatible with the Addititivty Hypothesis. Regarding the comparison between 'the' and 'that', however, we see that in three out of five corpora, 'the' significnatly precedes 'that' (see the Lily Corpus in Table 3.18, the Naomi Corpus in Table 3.20 and the Naima Corpus in Table 3.19).

Overall, pronouns thus reveal a clear ordering where 'it' precedes 'he' and 'she', but for definites, results are mixed. We find orderings compatible with the AH, and here, most often by comparing 'the' and 'that', however, the comparison between 'the' and 'this' reveals orderings incompatible with the AH.

Errors

In what follows, I want to briefly discuss the errors found across corpora. Table 3.23 shows that we can expect two types of errors. The first type is independent of the predictions made by the classical or uniform view, the second error type is predicted only on the basis of the uniform view. The error analysis was conducted in analogy to Stromswold (1996,[112]). Stromswold introduces a calculation for the error rate of any specific error type. This error rate compares the number of utterances of the error within the timeframe in which it is uttered with the numbers of all utterances that present opportunities where the child could have made this mistake.

Error Type	Classical View	Uniform view
Feature Errors	✓	✓
Structural Errors	-	✓

Table 3.23: Error Predictions

In the following, I discuss each error type in turn.

Feature Errors

Table 3.23 suggests that feature errors are to be expected in both the uniform and classical view. These include errors of gender disagreement between the construction and the referent, or number and case errors. As the definite article 'the' in English is not sensitive to gender, number or case, I will disregard it for the purposes of this analysis. Rather, I will

focus on the emergence of gender errors in children's production of third person pronouns. Table 3.24 below demonstrates the findings.

Transcript	Time Period of Error Occurrence	# Erros	# Adult-Like Uses	Error Rate
Lily	2;0 - 2;5	15	560	0.027
Naomi	1;10 - 2;5	14	377	0.037
Naima	1;8 - 2;0	10	660	0.015
Violet	1;10 - 2;3	2	187	0.011
Mark	2;6 - 3;11	10	559	0.018

Table 3.24: Feature Errors: Error Rate

Table 3.24 specifies the time course or period in each corpus in which gender errors occured. In most corpora, we see that the AFP precedes the error period, except for the Naomi-corpus where AFP falls together with the emergence of the first errors. Thus, even though children are adult-like in the production of pronouns in most cases, there seems to be a time in their production displaying erroneous utterances of the same constructions once they start using them frequently and independently. However, as becomes evident in the last three columns, errors are rare. The mean error rate across all five corpora is 2.1%. In other words, in only two percent of cases where the five children had the opportunity to utter a pronoun, they did so erroneously by assigning the wrong gender to the variable. This finding is not surprising from the perspective of Snyder's (2007,[107]) view on conservativity. If children are conservative in their acquisition, i.e. if they only start producing a construction when they are able to interpret it, we don't expect errors to occur at all. Regarding the difference between the uniform and classical view, this error type does not contribute any data that might differentiate between the two. However, its low occurrence offers an additional data point supporting Snyder's (2007,[107]) claim that children are conservative in their language production.

Structural Errors

As already hinted at above, there is one structural error type that is only predicted by the uniform view, in contrast to the feature errors predicted by both views. To be precise, if we

found a recurring emergence of children combining pronouns with overt NP complements, this would only be expected by the UV, as here, the difference between the definite article and pronouns lies in the overtness or covertness of the NP argument. It could be expected that children have not acquired the necessary tools for eliding the NP argument of pronouns yet and demonstrate the use of overt NP arguments. Of the five corpora checked here, only one corpus showed an emergence of this error type. Naomi utters the pronoun 'it' alongside an overt NP. Even though there are no tests available to confirm the complement-relationship, there is at least no break in prosody between the pronoun and the overt NP.

(133)   Naomi: *I throw it ice.
         Context: Naomi is playing with an ice-cube at breakfast. Age: 1;11 (n22)

(134)   Naomi: *I get it egg.
         Context: Naomi plays with toy birds and eggs. Age: 1;10 (n19)

(135)   Naomi: *Need it jacket.
         Context: Naomi wants to put her jacket on. (1;10, n09)

(136)   Lily: *And I use it potty, too. (2;2, lil34)

There are eight instances of this error type over the course of one and a half months (from 1;10 to 1;11), found in transcripts n09 until n28. The error rate (Stromswold (1996,[112])) is 5.8%. In other words, the eight instances of the errors present 5.8% of the overall opportunities Naomi had to use a pronoun or the definite article. This might seem at first glance as a bigger occurence than the gender errors, where the mean error rate was 2.1%. However, the error rate is sensitive to the time course of when the error occured, and this time period is shorter for the structural error than for the feature error. In addition, this error type was only found in the Naomi-corpus. There is only one additional instance of such an error in one of the other corpora, namely Lily (see (136)).
Both, the error rate of the feature error and the structural error are too low to be taken as empirical arguments in favor of children having serious trouble with acquiring the features or the covertness of the NP argument (according to the uniform view). These low percentages can also be seen as yet another argument pointing towards children's conservativity in first language production.

Adult Input

As the data is not strongly compatible with any version of the UVH and the classical view is not a predictor at all, another predictor for the data could be adult input. However, adult input can be excluded as a predictor, as adults use the second person indexical 'you' most often (see Table 3.25 below). Would children mirror the input of their caretakers, we would expect 'you' to be among those constructions that are produced first, in parallel to the overall frequency in adult speech. However, as is evident in Table 3.6 and as a result of the Binomial Test comparing the other constructions and the AFP of 'you' (see Table 3.26), 'you' is produced significantly later than would be expected from adult data.

Corpus	Frequency Ordering	Relative Frequency of the Phenomena per Month
Lily	the < you < I < it < that < this	the = 777; you=733.1; I=329.6; it=270.9; that=169.6; this=57.4
Naima	you < the < I < that < it < this	you=453; the=450.7; I=225.9; that=207.2; it=198.8; this=85.4
Violet	you < the < I < it < that < this	you=181.7; the=178; I=92; it=84; that=75.75; this=72.5
Naomi	you < the < it < that < I < this	you=116.7; the=86.6; it=54.7; that=29.8; I= 27.7; this=17.3
Mark	you < that < the < it < I < this	you=264; that=134.2; the= 113; it=82; I=63; this=33.9

Table 3.25: Adult Frequency

Constructions	Lily	Naima	Violet	Naomi	Mark
I < you	< 0.001	< 0.001	0.124	< 0.001	0.204
it < you	< 0.001	< 0.001	0.227	< 0.001	-
the < you	< 0.001	< 0.001	-	< 0.001	-

Table 3.26: Binomial Tests for 'you' in the Child Corpora

Even if we were to exclude adults' use of 'you' for the moment as an instance of Child

Directed Speech which is different from adults' usual behaviour, we can still observe that across corpora, adults' use of 'the' is much more frequent than their use of 'it'. For example, in the Mark corpus, the relative frequency of uses of 'the' is 134 times per month, whereas 'it' is only used 82 times per month - this does not align with AFP, where 'it' is produced significantly earlier than 'the'. Similarly, the adult frequency of using 'the' in the Violet corpus lies at 178 per month and the frequency of adult use of 'this' at 73 times per month. However, Violet produces 'this' significantly earlier than 'the'. These individual differences taken together with the fact that children start producing all constructions within only one to three months demonstrate that adult input is not a predictor for children's production of pronouns and definites.

Conversational Preference

In parallel to the previous section, one final alternative predictor for the emergence of definites and pronouns could not only be guided by adult input, but could also be guided by the preferences of the children in which topic they want to talk about, and thus, which construction they use first. For example, for those children who produce pronouns first, it could be possible that this is the case because they prefer talking about salient objects. In order to check if conversational preference is a viable predictor, similar to adult input, the question arises if the overall frequency of a construction in the children's utterances correlates with the age of first production. The overall frequency in the children's spontaneous speech is illustrated in the table below.

	the	he	she	it	this	that	I	you
Lily	2244	1737	373	283	1013	787	2852	1535
Naima	5179	2059	855	539	1576	1626	2457	1417
Violet	1074	567	170	12	1055	391	1112	554
Naomi	982	1141	191	103	925	731	1811	711
Mark	2649	1433	1097	135	757	1099	3295	1707
Mean overall	**2425.6**	1387.4	537.2	214.4	1065.2	926.8	**2305.4**	1184.8

Table 3.27: Frequency of Children's Spontaneous Speech, English Corpora

As we can see from the overall frequencies in Table 3.27, throughout all corpora, the most frequently used constructions are the definite article 'the' and the indexical pronoun

'I'. However, as we have seen in the discussion of the results on page 118, this is not what we find. Instead, for example in the Violet Corpus, 'this' is produced significantly before 'the', although the frequencies are almost the same. Likewise, 'this' is produced significantly before 'the' in the Mark Corpus, even though 'this' is much less frequent than 'the'. Additionally, even though 'it' is produced significantly before 'he' or 'she' in most corpora, it is less frequent than the other two constructions in all corpora. Consequently, the results from above do not align with children's conversational preference.

3.2.3 Discussion

This section reported a study on monolingually English speaking children's production of pronouns and definites. I looked at five longitudinal corpora within the CHILDES database and 1) determined the AFP, defined as the first among frequent uses of the construction, 2) compared the AFPs of the individual constructions within each corpus to see whether a recurring pattern of orderings would arise. This method was taken from Snyder (2007,[107]) who assumes ordered acquisition for constructions that are dependent on each other regarding their grammatical analysis. This comparison was done with the help of Binomial Tests on the basis of both months and transcripts. The analysis on the basis of transcripts revealed even more intervariation than the analysis on the basis of months. Overall, no recurring pattern of orderings could be observed across corpora. Each corpus demonstrated some significant orderings compatible with the UVH-COMP, but also the UVH-CTX.

Recapitulating both UVH hypotheses in (3.1), we said that they exclusively predict either a compositional or a contextually driven path. However, the present evidence is incompatible with either of the two versions of the UVH.

Regarding the interal composition of pronouns and definites, respectively, captured in the AH, we find that across all five corpora only orderings compatible with the AH within pronouns can be observed, whereas in the case of definites, the results are mixed.

The eight occurrences of an error that can only be predicted by the uniform view make it worthwhile to not reject this theoretical framework too hastily. Even though these errors could also be marked as arbitrary instances of production errors, the conservativity of children might suggest otherwise - especially considering that gender errors occur even

less frequently.

Results from the Mark-corpus have to be taken with caution. This corpus is a diary study accompanied by recordings. Still, errors in the transcriptions sometimes assigned utterances to Mark which were originally produced by his caretakers. But even when excluding this corpus, there are three additional ones that demonstrate considerable intervariation. Thus, this is not a conclusive argument.

Another theoretical revision could be to exclude indexical pronouns from the uniform analysis. As Elbourne (2013,[32]) never included an analysis of indexical pronouns in his discussion of the uniformity of definites and pronouns, we might posit that indexical pronouns are indeed contextual parameters as suggested by Kaplan (1989,[63]; see chapter 2, section 2.1.1, page 22). As a reminder, Kaplan (1989,[63]) argues that indexicals not only refer to some salient discourse referent, but that they refer to contextual referents whose roles are fixed. 'I' refers to the speaker in the context, 'you' to the addressee in the context. Thus, we could treat indexicals as a different species than third person pronouns and the definite article, which maintain a uniform analysis[8]. When excluding indexical pronouns, only the Violet and Mark corpus show orderings compatible with the UVH-CTX, while the Lily and Naima Corpora still demonstrate orderings compatible with the UVH-COMP. Consequently, this change still leaves us with intervariation and does not clarify the results in favour of either of the analyses.

Interim Summary: Production of Pronouns and Definites in English

Overall, we thus see that the order of first production is variable, contrary to the hypotheses put forward by the uniform view.

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[8]Under such a view, cases of deferred reference as introduced in chapter 2, section 2.1.2, on page 42 would need a different analysis than proposed in chapter 2. One possibility is to explain such cases with the help of a reinterpretation analysis. The context evokes considerable pressure on the indexical pronoun in cases of deferred reference so that its original interpretation as a pure contextual parameter has to be enriched in such a way that a relation between the parameter and the relevant group of people is inferred into the semantic analysis. This inference is not part of the basic analysis of indexical pronouns, but its necessity arises because of the specific contextual characteristics of the sentence.

3.3 A Corpus Study on the Production of Pronouns and Definites in German.

Including German data for the investigation of the relation between pronouns and definites can provide a more fine-grained distinction between the constructions. The study reported here is set up in a parallel way to the study on English children's production of pronouns and the definite article and includes corpora available on the CHILDES database.

The structure of this section mirrors that of the previous one. I will recapitulate the theoretical analysis, amend it so it matches the German data and revise the UV-hypothesis accordingly, while the AH-Hypothesis stays the same. Then, I will go through the study, introducing the corpora, identifying the AFP and statistically testing orderings within each corpus. Adult input will be taken into account as well and then a short discussion follows.

3.3.1 Analysis Revisited: The Strong/Weak-Distinction

In this section, I want to motivate in more depth why German data can give evidence for the classical/uniform view debate in a way that English cannot. In German, the definite article can be used as a demonstrative pronoun, i.e. without an overt NP complement. In this use, it is parallel to the English demonstratives 'this' and 'that'. However, the question arises if the demonstrative and definite use can be analysed on a par or if they only share the same form, without the same meaning. Tackling this issue will be crucial in formulating a hypothesis on the acquisition path of German children.

To unpack this issue, let us first consider in more depth the analysis of the definite article in German. Schwarz (2009,[103]) argues that a distinction has to be made between a strong and weak version of the definite article, as we have seen in chapter 2.

(137)
Hans	ging	zu	dem	Haus.
Hans	went	to.Prep	the$_{strong}$	house

'Hans went to the house.'

Schwarz (2009,[103]): 14, example (8a)

(138)
Hans	ging	zum	Haus.
Hans	went	to.Prep + the$_{weak}$	house

'Hans went to the house.'

Schwarz (2009,[103]): 14, example (8b)

More specifically, Schwarz (2009,[103]) suggests that as soon as the article contracts with a preposition, as in (138) above, it receives a weak interpretation. The weak interpretation is parallel to the interpretation of 'the' in English we assumed until now, presupposing uniqueness. The strong version (as in (137)), Schwarz (2009,[103]) claims, necessarily includes anaphoricity, i.e. there has to be an explicitly established referent in the context. The anaphoricity/uniqueness difference is captured by the two examples below. In (139), using the strong version of the definite is inappropriate, as here, the glass cabinet is not explicitly mentioned before, but is only established as a unique object in the situation. In (140), in turn, using the weak definite, so its contraction with the preposition 'von', is inappropriate, as the referent, i.e. the student, is explicitly mentioned and introduced as a discourse referent through A's question.

(139)

Das Buch,	das du suchst,	steht	{im/ $^{\#}$in dem}
the book	which you look-for.RC	stands	in+the$_{weak}$/ in the$_{strong}$
Glasschrank.			
glass-cabinet			

'The book which you are looking for, is in the glass-cabinet.'

Schwarz (2009,[103]): 39, example (40)

(140) A: Hast du schon mal einen Studenten durchfallen lassen?

'Have you let a student fail a test before?'

B:

Ja.	{Von dem/ $^{\#}$vom}	Studenten	habe	ich	nie
Yes.	Of the$_{strong}$/ of+the$_{weak}$	student	have	I	never
wieder	etwas	gehört.			
again	something	heard.			

'Yes. I have never heard anything about the student again.'

Schwarz (2009,[103]): 31, example (27)

Schwarz captures this strong/weak-difference by way of introducing an additional DP layer to the interpretation of the strong article. This DP layer introduces an index, which is analysed with the assignment function g (see (142)). The analysis of the weak article stays the same as introduced in chapter 2 (and repeated in (141)).

(141) $[\![\text{the}_{weak}]\!] = \lambda f_{<e,t>} : \exists!x[f(x)].\iota x[f(x)]$ (in parallel to Schwarz 2009)

(142)

```
                    DP
                   /  \
                  D    DP
                  |   /  \
                  1  D    NP
                     |
                  the_strong
```
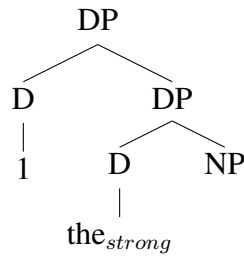
$[\![\text{ the}_{strong}]\!] = \lambda f_{<e,t>}.\lambda y.\iota x[f(x)\&x = y]$ (in parallel to Schwarz 2009)

What about the demonstrative use of the definite article, then? Patel-Grosz and Grosz (2017, [85]) propose that such a strong/weak-distinction is not only active in the case of the definite article, but that a parallel distinction is able to capture the relationship between personal and demonstrative pronouns, i.e. the demonstratively used definite. They argue that both demonstratives and pronouns show a parallel behaviour regarding reference to a gender-mismatched discourse participant. With the help of examples such as (143), it has been previously argued that demonstrative pronouns have to match the gender of the antecedent, and that this is the reason why demonstratives come with a necessary NP complement, be it covert or overt, while pronouns do not have to match the gender and thus also do not necessarily come with an NP complement (see e.g. Wiltschko (1998,[119])). Accordingly, using 'die' in (143) is ungrammatical, while using the pronoun 'sie' is fine. However, (144) is a counterexample to this claim, because here, a feminine demonstrative refers to a neuter antecedent.

(143)
Ein Mädchen	kam	zur Tür	herein.	{Sie/ *Die}	war	schön.
A girl.Neut	came	to+the door	in.	She.Fem/ Dem.Fem	was	pretty.

'A girl came in through the door. She was beautiful.'

Patel-Grosz and Grosz (2017,[85]): 5, example (10)

(144)
Dann	habe	ich	ein Mädchen	kennengelernt,	und
Then	have	I	a girl.Neut	met,	and
die	lud	mich	zu einem Grillabend	ein.	
Dem.Fem	invited	me	to a BBQ	V.Prt	

'Then I met a girl and she invited me to a barbeque.'

Patel-Grosz and Grosz (2017,[85]): 6, example (16)

Cases such as the above show, according to Patel-Grosz and Grosz (2017,[85]), that personal and demonstrative pronouns exhibit parallel behaviour and should receive an inter-

dependent analysis[9]. The differences between using personal or demonstrative pronouns can then be captured with the same strong-weak distinction as put forward by Schwarz (2009,[103]) for the definite article, so that, in parallel, only demonstratives are anaphoric, while personal pronouns are only used for unique referents.

(145) (a)

Wenn	ich	schwanger	werde,	werde
if	I	pregnant	become,	will
ich	{es$_{(weak)}$/ $^{\#}$das$_{(strong)}$}	auf jeden Fall	behalten.	
I	it$_{weak}$ / DEM.Neut	in any case	keep.	

'If I get pregnant, I will keep it.'

Patel-Grosz and Grosz (2017,[85]: 15, example (34a)

(b)

Wenn		ich	ein Kind	kriege,	werde	ich
if		I	a child	get,	will	I
{es$_{(weak)}$/das$_{(strong)}$}		auf jeden Fall	behalten.			
it$_{weak}$ / DEM.Neut		in any case	keep.			

'If I get a child, I will keep it.' Patel-Grosz and Grosz (2017,[85]):15, example (34b)

In (145a), the antecedent is not explicitly mentioned and so not available as a discourse referent. This is why it is inappropriate to use the demonstrative 'das' to refer to the unborn child, while it is fine to use the weak 'es'. In contrast, in (145b), the child is explicitly introduced in the antecedent of the conditional, and so it is fine to use both a strong and a weak pronoun to refer to it. Demonstrative pronouns thus receive the same analysis as the strong article in (142), just that the NP complement is silent. Personal pronouns receive a weak interpretation as in (141), with a silent NP complement as argument. Note that under this account, salience is encoded as anaphoricity to a previously mentioned discourse referent by way of an index. As shown in (145), personal pronouns in German seem to be able to be mapped to non-salient referents - the baby is only implicitly introduced in the context. A parallel example, the marble-example (86), has been discussed in chapter 2, section 2.1.3, where at least in English, using a pronoun is degraded. It is possible that German and English seem to differ in this regard. In addition to discourse anaphoricity, Patel-Grosz and Grosz also claim that there are additional pragmatic requirements that

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[9]See Patel-Grosz and Grosz (2017,[85]) for another argument in favor of treating personal and demonstrative pronouns on a par: they discuss cases where both personal and demonstrative pronouns can refer to explicitly and implicitly given referents on pages 8 to 10.

guide the use of either a demonstrative or a personal pronoun. In terms of structural economy, using a demonstrative should be dispreferred, as a more complex structure is used to refer to more or less the same referents. However, cases of emotivity, disambiguation and register are able to trump economy[10].

One important extension follows from Patel-Grosz and Grosz's (2017,[85]) account. It opens up a parallelity between the analysis of strong pronouns and indexical pronouns. In section 2.1.2, I proposed that an analysis of indexical pronouns going along a uniform view can be captured by introducing a relation and an index, following Nunberg (1999,[78]) and Elbourne (2008,[31]). Looking at the interpretation of the strong definite article in (142), we can see that in the lexical entry, an identity-relation between the index and the referent for the NP is encoded. Even though how this relation comes about in the two constructions differs (in case of the index, the relation necessarily is provided by context and is directly combined with the index, whereas here, an identity-relation is hard-wired in the entry of the definite), the concept of a more complex interpretation is taken up in both constructions. Thus, this analysis fits the complex analysis of indexical pronouns as proposed under the uniform view in chapter 2, section 2.1.2.

Overall, Patel-Grosz and Grosz (2017,[85]) assume a refined version of the uniform view, one I will call the Strong/Weak-Uniform View (S/W-UV), where there is a distinction between a strong definite article/pronoun and a weak version. The strong version includes an additional D layer introducing an index interpreted with the variable assignment g. The weak version is the standard analysis of the definite article. The classical view, in turn, does not need to be refined, as the definite article, pronouns and demonstratives receive a different analysis each anyway. Pronouns are variables interpreted via g and the definite article presupposes uniqueness. Yet, there is one adjustment. We need to account for the morphological identity of a definite and a demonstrative article. Schwarz's distinction between the strong and weak version of the definite article is able to capture the specifics about the German definite article and we can also employ it as part of the classical view, without having to assume an analysis of pronouns as weak articles. The analysis of personal pronouns remains the deciding difference between both accounts.

According to a compositionally driven pathway to a uniform grammar, the weak article/pronoun should precede the strong one in the time course of acquisition, as an addi-

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[10]See more details in the discussion on pages 21 to 31 in Patel-Grosz and Grosz (2017,[85]).

tional syntactic layer is present only in the strong version. This means specifically that third person pronouns and the definite article should precede the demonstrative article and indexical pronouns[11]. However, in a contextually driven pathway to a uniform grammar, it should be the other way around. As the strong article/pronoun has a closer connection to context, it should precede weaker ones. I revise the hypothesis in Table 3.1 accordingly. Regarding the classical view, we still do not propose any hypothesis, as even though the analyses differ in complexity, they are not related.

The production of the definite article, indexical and third person pronouns and demonstratives demonstrates a **recurring pattern** such that *either*
(a) **CONTEXT (CTX)**: strong pronouns (indexicals and demonstratives) aren't produced significantly later than weak pronouns/ weak definite article.
{ IDX, DEM } $\leq$ { DEF, PRO }
or
(b) **COMPOSITION (COMP)**: weak pronouns/ definite article aren't produced significantly later than strong pronouns (indexicals, demonstratives).
{ DEF, PRO } $\leq$ { DEM, IDX }

Table 3.28: The Strong/Weak Uniform View Hypothesis (S/W-UVH)

In other words, the additional aspect in the German data compared to the English data lies within the specific analysis of the German demonstrative, as it suggests a theoretical distinction between strong and weak analyses. This dinstinction then is extended to pronouns, but only within the refined uniform version as illustrated in Patel-Grosz and Grosz (2017,[85]). Another consequence of this fine-grained distinction accounted for in Table 3.28 is that here, the internal composition of definites, as previously captured in the Additivity Hypothesis in Table 3.2 is an integral part of the refined UVH here. The difference between the demonstrative and definite article plays a major role for the possible interdependence of pronouns and definites in German. Consequently, the Additivity Hypothesis for German will only be concerned with the internal composition of pronouns (see Table 3.29 below).

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[11]I assume here that their internal composition, which includes an index, qualifies as a strong interpretation.

> The first production of 'es' (corresponding to 'it' in English) is not significantly later than the first production of 'er' ('he') or 'sie' ('she').
>
> *it* ≤ { *he, she* }

Table 3.29: The (Revised) Additivity Hypothesis (AH) for German

3.3.2 Corpora

In parallel to the study of English learning children in section 3.2, the basis for this corpus study are five longitudinal corpora available on the CHILDES database. Yet again, I collected and analysed the corpora manually in a timeframe from first use to the age where the last of the constructions was acquired, searching for all relevant utterances of the children of third person pronouns, indexical pronouns, nominative and demonstrative uses of the definite article with the search tool CLAN. Start and ending of the recordings as well as the mean recording rate per month, the total number of utterances and transcripts are specified for each corpus in Table 3.30 below.

Child	First Recording	Last Recording	Mean Recording Rate (per Month)	Total # of Utterances	Total # of Transcripts
Sebastian (Rigol)	2;2	3;8	1,68	20503	132
Cosima (Rigol)	1;9	4;4	1,59	22170	126
Pauline (Rigol)	1;7	4;5	1,82	22072	133
Caroline	1;1	3;4	9,96	22835	239
Kerstin	1;5	3;4	2,06	16687	37

Table 3.30: Information about the Corpora: German

Coding

Utterances were coded according to adult-like and independent usage, excluding imitations, repetitions or routine utterances (cf. Snyder 2007). We once more coded the search results manually, systematically coding erroneous utterances as well. We excluded 'es'

as a help construction and 'sein' in its interpretation as the verb 'be' and all other uses irrelevant to this study.

Once again, we looked more closely at the utterances falling in the time frame from the first use that we could identify as adult-like and independent to confidently identifying the first among frequently repeated uses of each construction (the FRU). We used the three step method developed for the English study by 1) identifying the utterance as independent and adult-like from a purely semantic view 2) checking the context for a suitable referent and 3) coding for the type of referent used. The result can be seen in Table 3.31 below.

Corpus	Direct Context	Story Context	Abstract Referent	Total
Cosima	34	9	0	43
Pauline	39	4	0	43
Caroline	30	17	0	47
Kerstin	47	8	0	55
Sebastian	41	3	0	44
Total	191	41	0	232
Percentages	82%	18%	0%	

Table 3.31: Type of Referents

The results are parallel to the findings of the English study. Table 3.31 shows a similar percentage of children talking about referents within the direct discourse context (82% of times), while talking about referents within a displaced story context only at 18% of times. In contrast to the English data, the German children do not refer to abstract referents at all. Yet again, this coding method provides a stable confirmation of the AFP.

Probability of a Recurring Pattern of First Production

As the refined version of the uniform view makes slightly different predictions, I revise the number of orderings compatible with the refined uniform view in the following. While the total number of possible orderings is identical to that for the English data (15 in total), the orderings pattern differently. Now, fewer orderings are compatible with the two versions of the refined UVH, because both the demonstrative article (DEM) and indexical pronouns (IDX) cannot significantly precede the definite article (DEF) and third person pronouns

(PRO) in S/W-COMP, while it is exactly the other way around for S/W-CTX. In Table 3.32 below, the revised orderings are given. On the left are those orderings that are compatible with the S/W-COMP, on the right are those that are compatible with its mirror picture, the S/W-CTX. Note that both columns are mirror pictures of each other and come with 6 orderings compatible with either version. Recall also that both versions exclude each other.

Orderings Compatible with S/W-COMP	Orderings Compatible with S/W-CTX
{DEM, PRO, DEF} < IDX	IDX < {DEM, PRO, DEF}
{DEF, IDX, PRO} < DEM	DEM < {IDX, PRO, DEF}
PRO < {IDX, DEM, DEF}	{DEF, DEM, IDX} < PRO
DEF < {DEM, PRO, IDX}	{DEM, IDX, PRO} < DEF
{PRO, DEF} < {DEM, IDX}	{DEM, IDX} < {PRO, DEF}
{DEF, DEM, IDX, PRO}	{DEF, DEM, IDX, PRO}
Orderings Incompatible with Either Version	
{PRO, IDX} < {DEM, DEF}	
{DEM, DEF} < {PRO, IDX}	
{DEF, IDX} < {DEM, PRO}	
{DEM, PRO} <{DEF, IDX}	

Table 3.32: Ordering Possibilities

All orderings are compatible with the classical view, also in terms of the German data[12]. The probability of finding orderings that are compatible with either version of the S/W-UVH are indicated below:

(146)   Probability compatible with S/W-UVH observed across 5 corpora: $(6/15)^5 = 0.01**$

Since there are fewer orderings that are compatible with either version of the S/W-UVH, finding only orderings that are compatible with only the one or the other is even less probable than for the standard UVH. As a consequence, if we find that all five corpora only show ordering compatible with either S/W-COMP or S/W-CTX, we have a strong argument supporting the uniform view, as it is highly unlikely that this finding came out

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[12]With one exception: the weak and strong articles are assumed to be produced interdepently. However, as I am interested in the order of production of pronouns and definites, I will leave this small interdependence within the classical view aside here.

by chance. In other words, if we find orderings compatible with only one of the two views, there has to be some other reason explaining this than pure chance. In terms of the hypotheses in Table 3.28, this reason would be that the production of the constructions is interdependent.

The probability for finding orderings that are compatible with the Additivity Hypothesis in Table 3.29 in German is the same as for the English data, as we are still considering the relation between three corresponding constructions, 'er', 'sie' and 'es'. I still assume that the German pronoun 'es' (the counterpart of 'it') is not firstly produced significantly later than the first production of 'er' ('he' in English) or 'sie' ('she' in English).

3.3.3 Results

Age of First Production

As in section 3.2, the AFP was determined by identifying the first utterance of the phenomenon that was soon followed by regular use (see Snyder (2007,[107]) within the individual transcripts[13]. Age in months and the individual transcripts are given in the fourth column in Table 3.33 below. Here, only those constructions where included that were produced first among the four groups of phenomena (third person pronouns (PRO), indexical pronouns (IDX), definite (DEF) and demonstrative (DEM) article). The types of phenomenon per corpus are given in the second column, the individual constructions per phenomena class are given in the third column. See Appendix B for a complete list of the AFP of all constructions considered (excluding accusative, genitive and dative case-marked forms) in Table B.1 on page 199, as well as the raw number of tokens for the relevant constructions in Table B.2 on page 200, graphs of Production Development on page 200 and following, and a list of the relevant first utterances on page 195.

Overall, we see that German children offer approximately the same range of ages of first

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[13]The soon following regular use is illustrated in the graphs on Production Development in the Appendix B, page 192. Note that in the German corpora in general, in contrast to the English corpora, production of third person pronouns does not escalate as quickly as the production of demonstratives and indexicals. However, from a qualitative point of view, the individual utterances analysed suggests that pronouns are indeed produced and thus a AFP can still be identified. The higher increase in the indexical pronouns and demonstratives interestingly adds to the pragmatic preference for deictic uses. However, the measure here is not how frequently children use the constructions, but rather, from a qualitative point of view, if there is an observable order of first production observable across corpora.

Corpus	Phenomenon	Construction	AFP
Sebastian:	DEF	das	2;4 (sb020422)
	DEM	das	2;5 (sb020519)
	PRO	es	2;6 (sb020617)
	IDX	ich	2;6 (sb020617)
Kerstin:	DEF	die	2;1 (ka020101)
	DEM	das	1;6 (ke010606)
	PRO	er	2;4 (ke020416)
	IDX	ich	2;2 (ke020221)
Caroline:	DEF	der	2;0 (89-10-26)
	DEM	das	1;8 (89-06-29)
	PRO	es	2;4 (90-02-24)
	IDX	ich	1;10 (89-08-29)
Cosima:	DEF	der	2;0 (cs020026)
	DEM	das	2;0 (cs020026)
	PRO	sie	2;4 (cs020416)
	IDX	ich	2;2 (cs020220)
Pauline:	DEF	die	2;1 (pa020104)
	DEM	das	2;0 (pa020005)
	PRO	es	2;1 (pa020202)
	IDX	ich	1;11 (pa011106)

Table 3.33: Age of First Production (AFP)

production as the English children (1;4 - 2;6), ranging from 1;6 in the Kerstin Corpus to 2;6 in the Sebastian Corpus. Interestingly, German children are thus not delayed in their production of those phenomena in spite of the morphological case-marking. However, their production ranges in the individual corpora are not as immediately following each other as in the English corpora. Here, the constructions are produced within the longest time range of 10 months in the Kerstin-corpus, and also in the others, the time range is between 3 and 8 months. So even though the overall age when German children start producing the constructions is not later than for the English children, German children differ in how quickly each construction, once one is produced first, comes online.

Regarding the AFPs of the pronouns, here we see that the AH is not clearly borne out, as

was the case with English pronouns. Generally, German children start producing pronouns later than English children (in the English corpora, children started producing pronouns between age 1;6 and 3;0). Only in the Sebastian and Pauline corpus is it the case that 'es' is produced before 'er' or 'sie'. It remains to be seen, however, if these orderings where 'es' comes online later turn out to be significantly different from chance level. Still, we can already see that the English and German children behave differently in their production of pronouns.

	Sebastian	Kerstin	Caroline	Cosima	Pauline
er	2;7 (sb020714)	2;4 (ke020416)	2;2 (89-12-18)	2;5 (cs020513)	2;3 (pa020316)
sie	2;11 (sb021118)	2;6 (ke020602)	2;8 (90-06-15)	2;4 (cs020416)	2;4 (pa020428)
es	2;6 (sb020617)	2;10 (ke021027)	2;4 (90-02-24)	2;5 (cs020513)	2;1 (pa020202)

Table 3.34: Age of First Production (AFP): German Corpora, Pronouns

Statistical Analysis: Comparing Definites and Pronouns

As it has turned out to make a difference in the English corpus, I statistically analyse the ages of first production reported in Table 3.33 above on the basis of timecourse reflected in transcripts right away, as in most corpora, children were on average recorded twice per month. The Caroline Corpus even has a mean recording rate of 9,96 recordings per month. In parallel to the English corpora, I conducted Binomial Tests within each corpus to determine whether individual orderings of two constructions would turn out to be statistically significant. See details for this kind of analysis in section 3.2.

To recapitulate, the following tables demonstrating the results of the statistical analysis are ordered as follows. Construction 1 in each case is the construction where earlier occurrences in comparison to construction 2 have been found. The number of earlier occurrences of construction 1 is given in the third column. The relative frequencies of construction 1 and construction 2 are given in the fourth and fifth column, respectively.

The Cosima Corpus was excluded from statistical analysis, as no orderings came out as significant. Both in the Sebastian Corpus (see Table 3.35) and the Kerstin Corpus (see

Construction 1	Construction 2	# of Earlier Occurences of Constr. 1	Relative Frequency 1	Relative Frequency 2	P-Value
DEF: das	IDX: ich	4	0.0726	0.927	<0.001***
DEM: das	IDX: ich	4	0.362	0.638	0.017**

Table 3.35: Binomial Test: Sebastian Corpus (Transcripts)

Construction 1	Construction 2	# of Earlier Occurences of Constr. 1	Relative Frequency 1	Relative Frequency 2	P-Value
DEM: das	IDX: ich	24	0.465	0.534	<0.001***
DEF: die	IDX: ich	4	0.062	0.938	<0.001***

Table 3.36: Binomial Test: Kerstin Corpus (Transcripts)

Table 3.36), the definite and demonstrative article significantly precede the indexical pronoun 'ich'. In the Caroline Corpus, the demonstrative article significantly precedes both the definite article and the indexical pronoun (see Table 3.37). In the Pauline Corpus, the indexical pronoun 'ich' significantly precedes all other three constructions (see Table 3.38). Accordingly, we find that the Caroline and Pauline Corpus demonstrate orderings compatible with the S/W-CTX, while the Sebastian and Kerstin Corpus demonstrate orderings compatible with the S/W-COMP.

Construction 1	Construction 2	# of Earlier Occurences of Constr. 1	Relative Frequency 1	Relative Frequency 2	P-Value
DEM: das	DEF: der	9	0.367	0.633	<0.001***
DEM: das	IDX: ich	5	0.223	0.777	0.001***

Table 3.37: Binomial Test: Caroline-Corpus (Transcript)

Construction 1	Construction 2	# of Earlier Occurences of Constr. 1	Relative Frequency 1	Relative Frequency 2	P-Value
IDX: ich	DEM: das	32	0.594	0.406	<0.001***
IDX: ich	DEF: die	59	0.869	0.131	<0.001***
IDX: ich	PRO: es	59	0.956	0.043	0.07*

Table 3.38: Binomial Test: Pauline-Corpus (Transcript)

Construction 1	Construction 2	# of Earlier Occurences of Constr. 1	Relative Frequency 1	Relative Frequency 2	P-Value
sie	es	12	0.73	0.27	0.023*

Table 3.39: Binomial Test: Kerstin Corpus (Transcripts): Pronouns

Statistical Analysis: Pronoun-Internal Comparison

The AFPs of the individual pronouns in Table 3.34 suggested that German children might demonstrate a different pattern than the English children, where a clear preference for an ordering according to the AH was observed. The AFPs of the German children showed that 'es' is not always produced first. However, when looking at the individual corpora more closely by employing Binomial Tests, we observe that those cases where 'er' or 'sie' precede 'es' in the AFP are not statistically significant. The only exception is the Kerstin Corpus, where 'sie' significantly precedes 'es' (see Table 3.39) and where throughout the corpus, 'sie' is used more frequently than 'es' by the child.

Construction 1	Construction 2	# of Earlier Occurences of Constr. 1	Relative Frequency 1	Relative Frequency 2	P-Value
es	sie	10	0.63	0.37	0.01**

Table 3.40: Binomial Test: Sebastian Corpus (Transcripts): Pronouns

In the other three corpora, 'es' precedes 'sie' significantly (see Tables 3.40, 3.41 and 3.42). In the Cosima corpus, the AFPs of the three pronouns are too closely together, such that

no ordering can be observed.

Construction 1	Construction 2	# of Earlier Occurences of Constr. 1	Relative Frequency 1	Relative Frequency 2	P-Value
es	sie	16	0.78	0.22	0.019*

Table 3.41: Binomial Test: Caroline-Corpus (Transcript): Pronouns

Construction 1	Construction 2	# of Earlier Occurences of Constr. 1	Relative Frequency 1	Relative Frequency 2	P-Value
es	er	7	0.81	0.19	0.23
es	sie	21	0.85	0.15	0.033*

Table 3.42: Binomial Test: Pauline-Corpus (Transcript): Pronouns

Regarding definites, we have seen in the preceding section that regarding the internal composition of definites, only the Caroline Corpus revealed an ordering where the demonstrative article is produced first significantly before the definite article (see Table 3.37 above). All other corpora do not reveal significant orderings.

Overall, except for the Kerstin corpus, we indeed observe orderings compatible with the AH. This is even more surprising, as sensitivity towards case- and gender marking in a grammatical sense is a prerequisite not only for pronouns, but for definites as well. Given these additional syntactic constraints, still finding that 'er' and 'sie' show a tendency towards being produced after 'es' is a case in point in favor of the subsequent acquisition of these presuppositions.

Errors

Generally, the same types of errors are to be expected for the German data as in the case of the English corpora. First, for both the uniform and classical view, I expect the emergence of feature errors, where children assign the pronouns and the definite article the wrong gender, number and case feature. This is maybe even more expected in the German data, as here, gender-, number- and case agreement is morphologically obligatory. The prediction of finding a structural error only predicted by the uniform view such that children could

start out with combining a pronoun with an overt NP complement holds in German corpora as well. See the repetition of the table of error types in Table 3.43 below.

Error Type	Classical View	Uniform view
Feature Errors	✓	✓
Structural Errors	-	✓

Table 3.43: Error Predictions

Regarding the feature errors, the error analysis is parallel to the error analysis for the English data (cf. Stromswold (1996,[112])) with a few important extensions. In German, the definite article is obligatorily morphologically marked for grammatical gender, number and case. This is why I conducted the analysis by considering children's utterances of both the definite article and pronouns in turn. Unlike with the English data, I also counted errors of number- and case, not only of gender-errors, as the German system grammatically encodes these features.

Transcript	Time Period	# Errors	# Adult-Like Uses	Error Rate
Pauline	1;11 - 4;5	29	3060	0.01
Cosima	2;4 - 4;3	57	2309	0.025
Caroline	1;9 - 3;3	168	1588	0.106
Kerstin	1;5 - 3;4	137	832	0.165
Sebastian	2;4 - 3;8	161	1573	0.10

Table 3.44: Feature Errors in the Use of the Definite Article

Table 3.44 summarizes the findings for errors regarding children's use of the definite article. The time period in which the errors occur is specified in the second column. As in the English data, most corpora reveal that the definite article is produced adult-like before the error time period (see the Cosima, Caroline, Kerstin corpus). Only the Sebastian and Pauline corpus deviate. Columns 3 to 5 give the number of errors within this time period, the number of all adult-like utterances of definite articles and, lastly, the error rate. The mean error rate of all five corpora is 7.8 %. As a comparison, the mean error rate for gender errors in the English corpora was 2.1%. We can thus see that German children indeed have more difficulty in acquiring the correct feature assignment in the case of the definite article.

Transcript	Time Period	# Errors	# Adult-Like Uses	Error Rate
Pauline	2;3 - 4;0	22	2505	0.01
Cosima	2;2 - 3;7	20	1698	0.011
Caroline	2;0 - 3;3	37	1500	0.025
Kerstin	2;2 - 2;10	18	485	0.037
Sebastian	-	-	-	-

Table 3.45: Feature Errors in the Use of Pronouns

Table 3.45 summarizes the findings for errors regarding children's use of pronouns (third person and indexical pronouns) with the same setup as explained above. In two corpora (Pauline and Caroline), the AFP precedes the error time period, in the other two (Cosima and Kerstin), the AFP coincides with the start of the error time period. The mean error rate across all corpora for pronoun use is 1.7 %, much lower than for errors in the use of the definite article. Interestingly, this error rate is similar to that of erroneous pronoun use in English, suggesting that in the case of pronouns, the morphologically marked features do not make a difference for the production of these phenomena. However, the error rate for the definite article is much higher in both, the English error rate and the German error rate for pronouns, suggesting that here, children indeed have more trouble with the right feature assignment - in approximately 10% of times, German children use the definite article wrongly. Comparing the time course of errors with the overall length of the corpora (see Table 3.30), it is important to note that a clear end of the time period of erroneous uses cannot be established as that end coincides with the end of the overall transcripts. Taking this argument into account, it is likely that children produce even more errors in a longer time period than is possible to define with the present corpora.

Regarding the second error type, no examples were found in the five German corpora.

Adult Input

Another predictor for the acquisition of pronouns and the definite article could be adult input. Previously, I have excluded input because adults used the indexical pronoun 'you' most often, and even when leaving 'you' aside, the adult data did not match children's

Corpus	Frequency Ordering	Relative Frequency of the Phenomena per Month
Sebastian	das < du < der < ich < die < es	das = 478.6; du=359.9; der=283.7; ich=263.3; die=182.1; es=138.7
Cosima	das < du < die < ich < der < es	das=304.4; du=216.1; die=175.8; ich=160.5; der=110.2; es=100.9
Pauline	das < du < ich < die < der < es	das=261.3; du=222.7; ich=190.5; die=187.3; der=117.7; es=83.1
Kerstin	das < die < du < der < ich < den < sie	das=267.7; die=206.8; du=203.1; der=156.9; ich= 130.2; den=79.9; sie=51.6
Caroline	die < du < der < ich < das < den < es	die=233.8; du=204.7; der= 201.8; ich=160.6; das=154.2; den=64.8; es=53.2

Table 3.46: Adult Frequency

behaviour. The German data mirrors the English data. As Table 3.46 demonstrates, the indexical corresponding to 'you' in English, 'du', is among the most frequent constructions used by the adults. However, the children data show that constructions that are not as frequent as 'du' in the adult input are produced significantly earlier by the children, as e.g. 'es' and 'ich' in the Sebastian corpus (see Table 3.47), the definite article 'der' in the Cosima Corpus (see Table 3.48), 'das' and 'ich' in the Caroline Corpus (see Table 3.49) and 'die' and 'ich' in the Pauline corpus (see Table 3.50). The statistical significance was calculated with the help of Binomial Tests.

However, even if we leave 'you' aside as a special case of Child Directed Speech, we still have the case of the definite article, which is much more frequent than e.g. 'ich' in the adults' speech. Specifically, in the Caroline corpus, where Caroline produces 'ich' significantly earlier than any of the other constructions, the relative frequency of 'die' lies at 234 times per month, whereas 'ich' is only uttered 160 times per month by the adults.

Construction 1	Construction 2	# of Earlier Occurences of Constr. 1	Relative Frequency 1	Relative Frequency 2	P-Value
PRO: es	du	2	0.14	0.86	0.02**
IDX: ich	du	10	0.77	0.23	0.076*

Table 3.47: Binomial Test: Sebastian-Corpus ('du')

Construction 1	Construction 2	# of Earlier Occurences of Constr. 1	Relative Frequency 1	Relative Frequency 2	P-Value
DEF: der	du	5	0.52	0.48	0.037**

Table 3.48: Binomial Test: Cosima-Corpus ('du')

Thus, even excluding 'you', the adults' data still does not match children's production. Adult input can thus be excluded as a predictor for children's production of pronouns and definites.

Construction 1	Construction 2	# of Earlier Occurences of Constr. 1	Relative Frequency 1	Relative Frequency 2	P-Value
DEM: das	du	13	0.38	0.62	<0.001***
IDX: ich	du	8	0.69	0.31	0.049**

Table 3.49: Binomial Test: Caroline-Corpus ('du')

Construction 1	Construction 2	# of Earlier Occurences of Constr. 1	Relative Frequency 1	Relative Frequency 2	P-Value
DEF: die	du	4	0.33	0.67	0.012**
IDX: ich	du	97	0.77	0.23	<0.001***

Table 3.50: Binomial Test: Pauline-Corpus ('du')

Conversational Preference

A second alternative predictor for the emergence of pronouns and definites could be children's conversational preferences. Instead of reflecting children's language competence, a hypothesis linking children's preference to the data would say that the data simply demonstrate which construction - and by extension which topics in the conversation - children particularly like. If such a hypothesis would be true, we would likely find a coorelation between children's frequencies of use of the constructions and the age of production.

	der	die	das	er	sie	es	ich	du
Pauline	1433	2311	2914	168	237	657	3925	1193
Sebastian	1247	2123	2237	235	396	533	2788	743
Kerstin	335	345	632	18	22	53	509	418
Caroline	994	1531	397	65	30	90	2058	1258
Cosima	1370	1779	2785	129	188	643	3421	700
Mean Overall	107.8	1617.8	**1793**	123	174.6	395.2	**2540.2**	862,4

Table 3.51: Frequency of Children's Spontaneous Speech, German Corpora

As is shown in Table 3.51, throughout all corpora, the german children use 'das' and 'ich' most often. Note, however, that in these data, no difference can be made between the demonstrative use of definites and the use as a definite article. Still, the frequencies above suggest that throughout all corpora, the indexical 'ich' should be produced first. However, Sebastian, Kerstin and Caroline demonstrate orderings where a demonstrative or definite is produced significantly before the indexical. Thus, as with the English corpora, conversational preference can be excluded as a predictor.

3.3.4 Discussion

This section reported a corpus study on the first production of pronouns and definites by monolingually German learning children. This study complements the study of monolingually English learning children in the previous section. I considered German data, because here, even though both the classical view and the uniform view can account for them, the uniform view especially has to be revised in further distinguishing between weak and strong definite article/ pronouns. The method employed here was parallel to the En-

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glish study. I revised the UV-hypothesis in such a way that it can account for the more fine-grained distinction between strong and weak pronouns/articles within a uniform view framework. With these refinements, fewer orderings of the four constructions are compatible with a compositionally or contextually motivated acquisition path, and thus, finding orderings within the five corpora which only align with the one or the other version could be statistically significant. However, this is not what we find. Instead, the statistical anaylsis reveals that in 2 out of 5 corpora, orderings are significant that are compatible with the S/W-CTX. In the Pauline Corpus, the indexical pronoun 'ich' precedes both the definite article and the third person pronoun 'es' significantly. In the Caroline Corpus, the demonstrative article precedes the definite one significantly. On the other hand, we find 2 out of 5 corpora that demonstrate orderings compatible with the S/W-COMP. In the Sebastian Corpus and the Kerstin Corpus, the definite article precedes the indexical pronoun 'ich'. The results thus show that there is considerable intervariation, even more than in the English corpora. Remember that the classical view does not suggest any particular order different from the UVH, but that rather, intervariation is more plausible in light of this account. Regarding the Additivity Hypothesis, we see that the plain ages of first production might suggest that in German, we find no subsequent development of when pronouns with more specific gender features are first produced compared to the more basic case. However, looking at the individual corpora more closely reveals that still, most corpora show orderings compatible with the AH - with one exception.

Interim Summary: Production of Pronouns and Definites in German

Overall, we see that despite minor differences between the English and German analyses and corresponding hypotheses, we still find considerbale intervariation within the age of first production. This is not compatible with the hypotheses put forward by the uniform view.

3.4 Interim Summary: Production Studies

In both German and English, the data show considerable intervariation in when one of the four constructions is produced first relative to the others. Across the two languages and

all ten corpora, we cannot observe any recurring pattern in the data of one construction always preceding or following the other ones.

Accordingly, as the uniform view and its refined daughter, the strong/weak uniform view, predict such a recurring pattern, the results are incompatible with the predictions of the uniform view as formulated in (3.1) and (3.28).

For the Additivity Hypothesis, the data for both languages demonstrate that pragmatically more constrained pronouns, like 'he' or 'she' (or 'er' and 'sie', respectively), are generally not acquired significantly earlier than the simpler case. And throughout, 'it' or 'es', respectively, are also more frequent in the children's utterances. This finding is supporting a view where additional structural layers are learned subsequently. However, for definites, German and English children seem to be more flexible. Some of the corpora reveal significant orderings where a demonstrative precedes a definite.

Chapter 4

Children's Comprehension of Pronouns and Definites

In the previous chapter, I have introduced two corpus studies on the production of definites and pronouns in English and in German. The results have shown that there is considerable intervariation regarding the order of first production of these constructions.

In this chapter, I present an experiment on children's comprehension on definites and pronouns, in order to pay specific attention to the contextual setting of the utterances and the compliance or experimentally controlled non-compliance with the requirements associated with pronouns and definites. By experimentally testing children's comprehension of these constructions, we can make sure that the context meets or does not meet the necessary requirements. Thus, the results complement the results of the studies reported in the previous chapter.

Another reason to include a study of children's comprehension of pronouns and the definite article compared to two studies on children's production of the phenomena is that in previous literature, and especially regarding pronouns, discrepancies between comprehension and production have been found. Thus, the following study on children's comprehension will complement the production studies in this vein as well. Taking conservativity (cf. Snyder (2007,[107]) at face value, comprehension of a certain construction should never follow its production. However, it could well be that children understand a construction much earlier before uttering it the first time. Accordingly, for gaining a better understanding of children's acquisition of pronouns and definites, we have to consider children's

comprehension as well[1].

4.1   Research Question and Hypotheses

In this chapter, I want to focus on the core pragmatic components of the definite article and third person pronouns, specifically. Research question (124) (repeated in (147)) pays special attention to the last stage in the acquisition process of definites and pronouns. This stage is concerned with the acquisition of the additional pragmatic requirements within both groups (see as a reminder Table 4.1).

(147)   How does the acquisition of the presuppositions of each pronouns and definites proceed?

	Definites	Pronouns
Final Stage	unique and familiar referents	salient referents

Table 4.1: Final Stage: Identification of Referents

In the previous chapter, I investigated if a recurring pattern can be observed in the first production of phi-features. However, whereas phi-features differ for the individual pronouns, one pragmatic requirement is the same for all pronouns, that is salience. Likewise, in the case of definites, both the definite article and demonstratives require their referent to be unique. Thus, both uniqueness for definites and salience for pronouns are the core for the pragmatic interpretation of the two groups. While at the end of the critical stages, children know that definites and pronouns require a one-to-one mapping between construction and referent, it is not clear when and how children learn about these two core requirements. Are they inherently learnt as soon as definites and pronouns are learned or is there a stage between having learned that there is a mapping and learning which specific requirements are obligatory? For example, only because children observe that pronouns are used for salient referents, does not necessarily mean that they can identify salience as an obligatory requirement as opposed to a characteristic of the referent that just happens

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[1]The data reported in section 4.2 is the result of joint work with Valentine Hacquard, Jeffrey Lidz and Sara McConnell and is published in a previous form in Brockmann et al. (to appear,[12]).

to apply. Additionally, it has been shown in Section 2.2.2 that the language input children are exposed to is messy. Pronouns can also be mapped to unique referents, and definites also refer to salient referents. Only the more immediate relationship between pronouns and the discourse context, where the use of a pronoun is often accompanied by a pointing gesture, might facilitate the acquisition of pronouns compared to definites. Previous work on the acquisition of pronouns and definites confirms this possibility (see Section 2.2.4). Whereas Song and Fisher (2003,[110]) show that three-year-olds are sensitive to discourse prominence when hearing a pronoun, van Hout et al. (2010,[57]) report findings where even older children have problems with distinguishing the use of the definite from the indefinite article. The following experiment will consider three-year-old's comprehension of definites and pronouns in order to more closely investigate the role of the core pragmatic requirements within each group. At the age of three, children produce pronouns and definites frequently, as shown in the previous chapter. In chapter 2, section 2.2.3 on page 81, I have shown that under the compositionally guided pathway to a uniform target grammar, an ordering of when the pragmatic requirements are learnt needs to follow. As the salience-feature of pronouns adds additional layers within the DP structure, it should be learnt after the uniqueness and familiarity constraints of definites. However, because in this study, we are considering children's comprehension rather than production, the same assumption follows for the comprehension of definites and pronouns under a contextually guided pathway to a uniform grammar, because the emergence of pronouns before definites is only assumed in terms of language production. Thus, we should observe that three-year-olds should be adult-like in their comprehension of both pronouns and definites, but at least in the comprehension of definites as it precedes the comprehension of pronouns. This hypothesis is captured in Table 4.2 below.

> Three-year-olds are adult-like in their comprehension of the contextual requirements of at least the definite article, and possibly of pronouns, i.e. they successfully map the use of pronouns to salient referents and the use of definites to unique and familiar referents.

Table 4.2: Uniform View Hypothesis: Comprehension

The hypothesis in Table 4.3 is an alternative which mirrors previous findings about children's behaviour, as well as a continuation of the more immediate influence of the direct

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Three-year-olds perform better in mapping pronouns to salient discourse referents than in mapping definites to unique and familiar referents.

Table 4.3: Stronger Pragmatic Clue Hypothesis

context in the case of pronouns as opposed to definites. This hypothesis is not compatible with the uniform view, but with the classical view, as in this view, the acquisition processes of pronouns and definites are not related.

4.2 The Experiment

4.2.1 The Task

As the focus of this experiment is on children's understanding of the contextual requirements associated with definites and pronouns, our goal was to test this within the same task, by manipulating salience and uniqueness. As a control condition, we also included indefinites, as in previous work, the comparison between definites and indefinites has proven to be difficult for children (see e.g. van Hout et al. (2010,[57]). We used a selection task where novel words label unfamiliar objects. When the children hear novel words, they have to pay attention to the information provided by the use of the construction (pronoun vs. definite vs. indefinite) to select the right object. In other words, children cannot make inferences based on the meaning of the NP complement. They need to base their inferences on the articles or pronouns used in a given context.

4.2.2 The Design

Children are presented with three unfamiliar objects (pictures of objects unlikely to be familiar to children, e.g. a tube cutter, a bagpipe or an exotic fruit). One of the toys is different from the other two. This setting establishes uniqueness in the case of the one unique object. Then, the experimenter draws attention to either the unique object, one of the non-unique objects or none of the objects. This procedure makes it possible to capture salience.
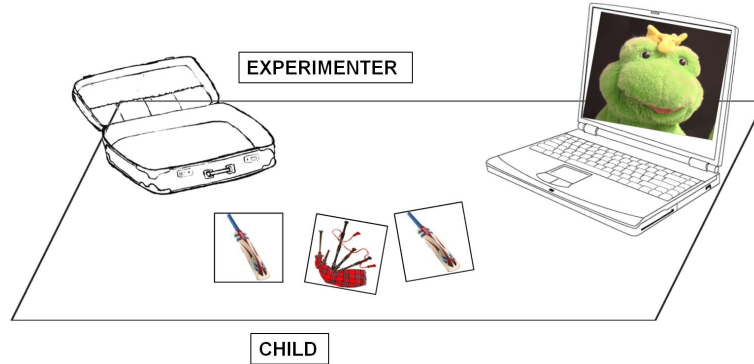
Figure 4.1: Study Setup

Specifically, the experiment is set up as a game (see Figure 4.1). Froggy is visiting his grandmother, but has forgotten to bring toys. So the experimenter asks the child if they should pack a suitcase for Froggy together. In order to find out which toys Froggy wants, the experimenter and the child Skype with Froggy. The experimenter displays three cards with pictures of unfamiliar objects, Froggy's toys, and draws attention to one of the toys. Then, Froggy gives his clue, in the form of a sentence like the ones in (148) to (150). After this, the child picks one of the three toys and puts it in the suitcase.

(148)   *Pack the blicket in the suitcase!*

(149)   *Pack a blicket in the suitcase!*

(150)   *Pack it in the suitcase!*

The Skype session is a video of Froggy that the experimenter pauses while interacting with the child. In order to give the impression that Froggy is taking an active part in the conversation, experimenter and Froggy exchange some introductory remarks at the beginning. We tested children in a between-subjects design, separating participants in two groups. Group 1 heard either the definite or indefinite article (from now on abbreviated as Group DEF/INDEF); group 2 heard the definite article or the pronoun 'it' (abbreviated as Group DEF/PRO).

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In examples (151) to (153), we provide some sample target interactions within group 1, comparing the definite and the indefinite article. We include three context conditions, alternating which toy the experimenter pays special attention to:

(151) Context 1: No Extra Attention
Experimenter: *[experimenter does not point to any toy]* Froggy, which toy do you want us to pack?
Froggy: Pack {the blicket/ a blicket} in the suitcase.

(152) Context 2: Attention to Unique Toy
Experimenter: *[experimenter points to the unique toy]*Oh, look at this one! I really like its color, it's red! Froggy, which toy do you want us to pack?
Froggy: Pack {the gorp/ a gorp} in the suitcase.

(153) Context 3: Attention to Non-Unique Toy
Experimenter: *[experimenter points to one of the non-unique toys]*Oh, look at this one! I really like its shape, it's funny! Froggy, which toy do you want us to pack?
Froggy: Pack {the glark/ a glark} in the suitcase.

The same context conditions were used for the second group, but Froggy would use either definites or the pronoun 'it' (see (154) below).

(154) {No Attention/ Attention to Unique Toy/ Attention to Non-Unique Toy}
Froggy: Pack {the blicket/ it} in the suitcase.

Table 4.4 summarizes how the design of the study reflects the theoretically derived contextual requirements by indicating which contextual requirement, i.e. either uniqueness or salience, targets which toy. In the first context, where none of the toys is singled out by the experimenter, only uniqueness is given, as the visual setting singles out one of the toys. Thus, here visual uniqueness targets the unique toy. In the second context, the experimenter draws attention to the unique toy. Here, both uniqueness and salience are given and target the same toy. In the third context, the experimenter draws attention to one of the two non-unique toys. Thus, uniqueness and salience are in competition. Whereas the experimenter establishes a non-unique toy as salient, the pure visual context provides a different toy that meets the uniqueness requirement.

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	Uniqueness	Salience
Context 1: No Attention	Unique Toy	-
Context 2: Attention to Unique Toy	Unique Toy	Unique Toy
Context 3: Attention to Non-Unique Toy	Unique Toy	Salient, Non-Unique Toy

Table 4.4: Contextual Requirements as Met by the Study Design

According to Table 4.4, children should pick the visually unique toy across all contexts when they hear the definite article. In turn, they should pick the toy made salient by the experimenter when hearing a pronoun, so when the unique toy is made salient in context 2, they should pick that toy, and when one of the non-unique toys is made salient, they should pick this toy instead of the visually unique toy.

4.2.3 Methods

To make sure that children are able to perform the task in general, we included four trials where the toys presented were familiar, using familiar labels. For the actual experimental trials, we included four trials per condition with a 2x3 design, with two construction conditions (definite/indefinite article or definite article/pronoun) and three context conditions (no attention, attention to unique toy, attention to non-unique toy). We also included 4 control trials where Froggy wants the child to pick a toy without giving a clue. These control trials checked whether children would pick toys by preference of location only, e.g. if they would always pick the rightmost toy[2]. The order of trials was pseudo-randomized and was the same for all participants. We tested an adult control group with the same material. Our measure for the statistical analysis was the percentage to which children would pick the unique toy. A summary of the setup is given in Table 4.5 below. Also, the actual trials and respective order is given in the appendix.

As the main finding of our original sample in group 1 (DEF/INDEF) demonstrated that

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[2]Here, the raw percentages suggest that the position of toy did not influence children's behaviour: for the original sample of three-year-olds, children across both groups picked the leftmost toy 43.6%, the middle toy 30.7% and the rightmost toy 25.6% of times. In all trials taken together, children picked the leftmost toy 30.1%, the middle toy 36.1 % and the rightmost toy 33.7% of times.

Groups:	Group 1 (DEF/INDEF) & Group 2 (DEF/PRO)
Conditions:	2 (Construction) x 3 (Context)
Tests:	4
Target Items:	4 Per Condition: 24
Controls:	4 Trials
Order:	Pseudo-randomized, 1 list
Overall # of Trials:	32
Approx. Duration:	15 - 20 Minutes

Table 4.5: Summary of the Design

three-year-olds pick the unique toy to the same extent regardless of which article is used, we conducted a follow-up study, in which we tweaked the material to prevent a type/token confusion. As the toys are presented as pictures on flashcards with the two non-unique toys being represented by two identical pictures, a reasoning could follow where these two toys are interpreted as two tokens of the same type of toy. There being two of them does not really matter then, because Froggy identifies the type of toy he wants to pack. In this case, the distinction between unique and non-unique toys vanishes completely and the visual context would not meet uniqueness as a contextual requirement at all. Consequently, the only clue available for both constructions would be whether one of the two types of toys is made salient. Participants would just pick whichever toy is made salient. To address these methodological concerns, we cut out all the toys to make them appear more life-like and we changed one of the two non-unique toys slightly, for instance by changing the color or by adding small dots or stripes to them. With this manipulation we hoped to create a situation where, even though the two non-unique toys can be identified as being the same type of toy, there are two distinct tokens of this toy and because of their differences, Froggy must be referring to the token rather than the type of toy when he says which toy he wants to pack. Everything else in the study setup stayed the same as in the original study. We also tested an adult control group for the follow-up study with the same material in both groups, DEF/INDEF and DEF/PRO. Regarding the children, we only tested the follow-up sample in the DEF/INDEF group.

For the statistical analysis, we combined the results of the original samples and the follow-

up samples and tested whether the change in material would have a significant overall effect for the choice of the children or the adults, respectively. However, as it turns out, the difference between the original sample and the follow-up sample with new material did not reach significance in the children data (*p = 0.2684; z-value = -1.107; SE = 0.414*). Neither did the difference turn out to be significant in the adult sample (group DEF/INDEF: *p = 0.288; z-value = 1.062; SE = 0.3438*[3]; group DEF/PRO: *p = 0.29145; z-value = -1.055; SE = 0.43539*). This is why in the following, I will maintain presenting the data of both samples together for children and adults, respectively.

4.2.4 Subjects

We tested 38 participants, 13 participants in group DEF/INDEF (7 female, 6 male), 15 participants for group DEF/PRO (8 female, 7 male). All participants were between 2;11 and 3;11 years old (mean age: 3;4) and were tested in the Project of Children's Language Learning at the University of Maryland. They were all native speakers of English. 10 participants were excluded because they did not finish the study (most often, because the children were not patient enough to sit through the complete experiment). We tested 23 participants for the follow-up study. 10 had to be excluded because of technical problems with the recordings or because the children did not finish the study, leaving 12 participants (5 male, 7 female) considered for the statistical analysis. All participants were between 3;0 and 3;11 (mean age: 3;6) and were also tested in the Project of Children's Language Learning at the University of Maryland.

In addition, we tested an adult control group with the original material and setup. These were all native speakers of English, 6 participants were tested at the University of Maryland and 18 participants were tested at the University of Tübingen, distributing participants evenly over the two groups. The age range of adults was 19 to 37 years with a mean age of 22.0 years. Female/Male ratio was 50%. For the follow-up study, we tested 24 participants, 12 in the DEF/INDEF group and 12 in the DEF/PRO group. All participants were tested at the University of Tübingen. The age range here was 20 to 58 years with a mean age of 26.0 years. Female/Male ratio was 59% female, 41% male.

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[3]Note that here, the three factor model (Construction x Context x Material) did not converge. However, as construction did not have an effect, we removed it from the model.

4.2.5 Predictions

Group 1: Definite vs. Indefinite Article (DEF/INDEF)

Our measure as a basis for the statistical analysis is the selection of the unique toy. If children have an adult-like understanding of the uniqueness requirement of definites (following the Hypothesis in Table 4.2), we expect that they should pick the unique toy whenever the definite article is used, irrespective of which toy is being made salient. Regarding the indefinite article, we expect children to be at chance at picking the unique toy. If children have an adult-like understanding of the uniqueness requirement and they are able to compute a scalar implicature[4] that the speaker should have used the definite article if the unique toy was intended, they should pick one of the two non-unique toys. However, given that children have difficulty computing implicatures at this age (see e.g. Pouscolous (2012,[88]); Papafragou & Musolino (2003, [83]); Geurts (2010,[41]); Guasti et al. (2005,[48]); Chierchia et al. (2004,[18])), we expect that they will be at chance in picking the unique toy or one of the two non-unique toys. We set the chance level here at 33%, because children can pick from three choices.

The difference between expected behavior with definites vs. indefinites leads to an expected main effect of construction type in group DEF/INDEF. The unique toy should be selected more often across all three context conditions when Froggy uses the definite article than when Froggy uses the indefinite article (see Figure 4.2).

Regarding the definite article, we estimate that the visual context should suffice in establishing the visually unique toy as the only available referent for the definite article in the 'No Extra Attention' context (see the leftmost black column). Accordingly, if children are adult-like in their comprehension of the definite article, they should pick this toy. However, as no other contextual clue is given, they may not be at ceiling.

When the experimenter pays special attention to the visually unique toy ('Attention to Unique Toy', middle black column), the visual context is reinforced through the behavior of the experimenter, who makes the already visually unique toy salient by talking about it. In this case, the unique toy is both unique and salient and so children should be at ceiling when hearing the definite article.

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[4]For now, I will stay agnostic as to whether the competition between the definite and indefinite article should be analyzed as a scalar implicature or as a anti-uniqueness presupposition.
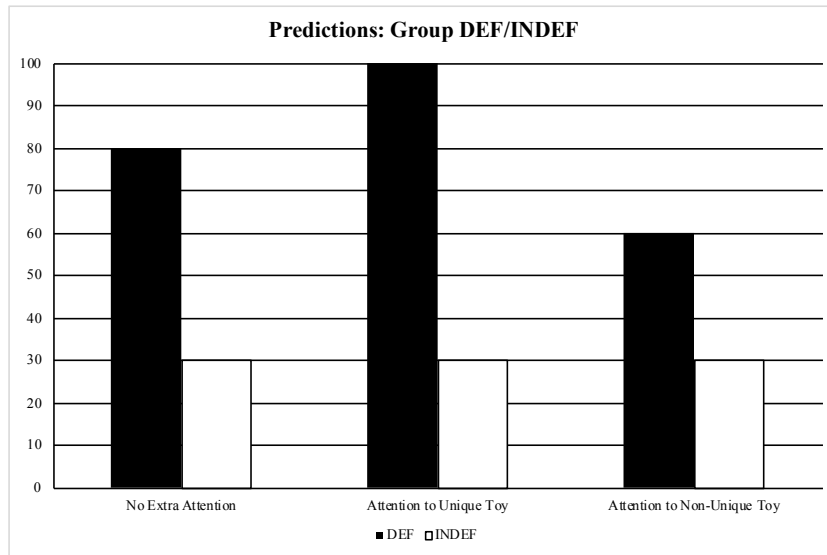
Predictions: Group DEF/INDEF

Figure 4.2: Predictions: Percentage of Selection of the Unique Toy, Group DEF/INDEF

Lastly, when the experimenter draws attention to one of the two non-unique toys ('Attention to Non-Unique Toy', rightmost black column), the visual context is competing with the actions of the experimenter. While visually, the unique toy stands out, the experimenter singles out one of the two non-unique toys as the salient one. When hearing the definite article, children could stick to the visually unique toy and choose that one as the referent, but they could also reinterpret the definite article in picking out that toy which is unique by virtue of having been talked about by the experimenter. Note that this interpretation of the situation goes along a standard interpretation of the definite article. We expect that children should stick to the visual context no matter the manipulations made by the experimenter. However, due to the strong competition, they may pick the unique toy to a lesser extent when hearing the definite article than in the other two contexts, while still being above chance.

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Group 2: Definite Article vs. Pronoun (DEF/PRO)

Still considering the percentage of how often children pick the visually unique toy, we expect different results for group DEF/PRO. Here, children should pick the salient toy when Froggy utters a pronoun, irrespective of the toy being the visually unique one. When children hear the definite article, they should still pick the visually unique toy no matter the context, so they should behave as the children encountering the definite article in group DEF/INDEF. This leads to an expected **interaction between construction and context type** (see Figure 4.3). The type of context should play a much bigger role for pronouns than for the definite article, as only for pronouns, the choice of referent depends on salience and salience differs from context to context, while (at least visual) uniqueness stays the same.
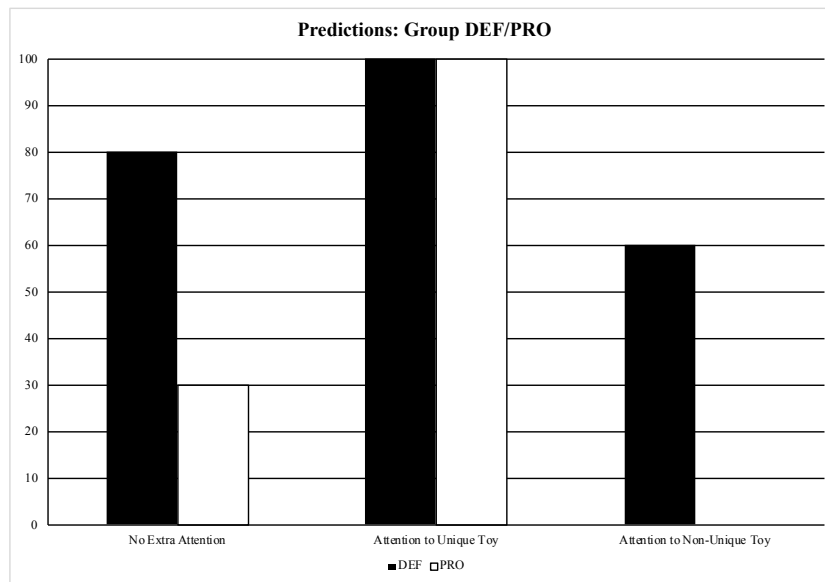
Figure 4.3: Predictions: Precentage of Selection of Unique Toy, Group DEF/PRO

We will talk about each condition individually. We start with the two middle columns, representing the context where the experimenter draws attention to the unique toy. The black column gives the percentage of children picking the visually unique toy when hearing the definite article, the white column when hearing the pronoun 'it'. The expectations for the former case mirror the expectations for group DEF/INDEF. The visual context and the ex-

perimenter's manipulation both target the unique toy and thus children should always pick it when hearing the definite article, so in 100 % of cases. As the unique toy is the salient toy, the same is the case for pronouns. 'It' targets the unique toy and so children should pick it in 100 % of the cases.

The two rightmost columns represent the context where the experimenter draws special attention to one of the two non-unique toys. Here, expectations differ dramatically for the definite article and the pronouns. Specifically, while we still expect children to be above chance in picking the visually unique toy when hearing the definite article (see the black column), they should never pick the unique toy when one of the other toys is made salient, so here we expect children to pick the visually unique toy in 0% of cases (see the white column, or rather the absence of it).

Lastly, the two leftmost columns represent the context where the experimenter does not draw attention to any toy. This context as such is already problematic for pronouns, as the context does not meet the salience requirement. In this case, when Froggy uses a pronoun out of the blue, we cannot expect any particular reactions by the children on the basis of our theoretical assumptions. Instead, we expect children to be at chance in picking the unique toy, as nothing else in the context can guide their choice (see white column). The expectation for the definite article, in turn, are the same as for group DEF/INDEF. Children should be above chance in picking the unique toy, as the visual context satisfies the uniqueness presupposition.

4.2.6 Results

In the following, we will present the results of the statistical analysis conducted on the basis of a generalized mixed model in R (R Core Team (2014,[90])) for each study in turn. The binary dependent variable UNIQUE (1=unique object; 0= non-unique object) was analyzed according to a 2x3 design with a Generalized Linear Mixed Model (GLMM) with a logit link function in R. The two fixed factors were the three-level factor CONTEXT (No Attention, Attention to Unique Toy, Attention to Non-Unique Toy) crossed with the two-level factor CONSTRUCTION (group 1 (DEF/INDEF): definite vs. indefinite article; group 2 (DEF/PRO): definite article vs. pronoun); intercepts of participants and items were used as random factors. The 'No Attention' condition was determined as a refer-

ence condition for the three-level factor CONTEXT, i.e., the two contrasts compared the 'Attention to Unique Toy' and the 'Attention to Non-Unique Toy' to the 'No Attention' condition.

Results Group 1: Definite Article vs. Indefinite Article (DEF/INDEF)

Overall, the main finding for group DEF/INDEF is that **no main effect of construction** can be observed (see Figure 4.4). If children were sensitive to the uniqueness presupposition of the definite article, we would expect them to pick the unique toy across all three contexts significantly more often when Froggy uses the definite article than when he uses the indefinite article. However, they pick the unique toy to the same extent regardless of which article is used. We observe a statistically significant contrast (*p = 0.0265; z-value = 2.218; SE = 0.41868*) comparing the context where the unique toy is made salient with the context where nothing is made salient. Here, the selection of the unique toy only depends on which toy has been made salient in the context, no matter which construction is used. These results mean that either children are not sensitive to the uniqueness presupposition of the definite article, or our task does not provide a strong enough clue for uniqueness.
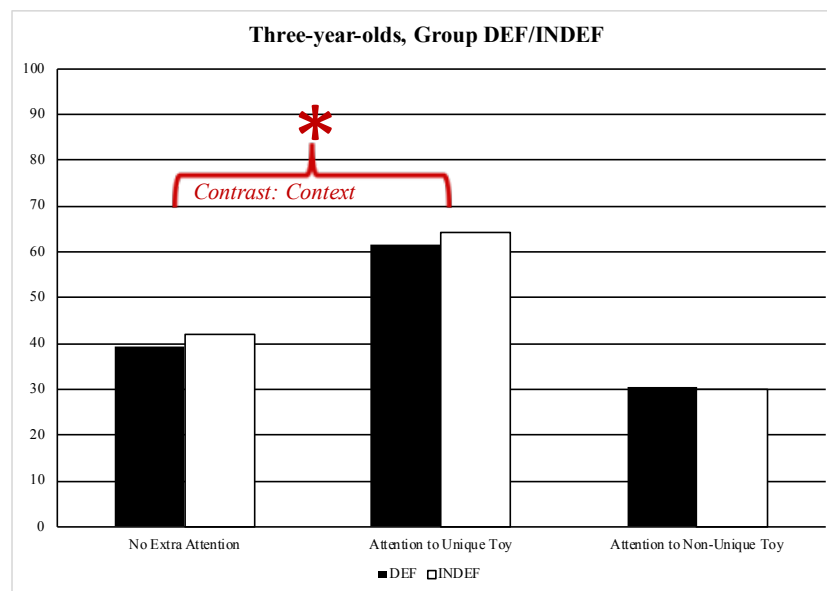

Figure 4.4: Results: Percentage of Selection of Unique Toy, Children, Group DEF/INDEF

More specifically, in the context 'No Extra Attention' (two leftmost columns), children pick the unique toy roughly 40% of the time both when the definite and when the indefinite article is used. This is not statistically different from chance[5]. This finding suggests that the visual context alone is not a strong enough clue for uniqueness or that children have not mastered the uniqueness requirement yet. In the 'Attention to Unique Toy' context, children are significantly above chance in picking the unique toy. However, this is the case whether the definite or the indefinite article is used. In the 'Attention to Non-Unique Toy' context, children behave as in the 'No Extra Attention' context, they are roughly at chance in picking the unique toy, both when Froggy utters the definite or the indefinite article. In other words, the visually unique toy does not serve as a clear referent in the case of the definite article, but neither does the salient toy.

Overall, the data gives rise to three explanations. Either three-year-olds have not mastered the uniqueness presupposition yet, or the visual context is not sufficient in singling out the unique toy, or our material is still, even with incorporating the new material, not able to test children's sensitivity to uniqueness adequately.

Surprisingly, the adult results overall replicate the results of the children. There is no main effect of construction. The bare percentages in Figure 4.5 show that in the case of the definite article (see the black columns), the context has a bigger effect than in the case of the indefinite article. The percentages of when adults pick the unique toy increased in the contexts where it is made salient and where one of the two non-unique toys is made salient compared to the context with no exta attention. In the case of the indefinite article, adults pick the unique toy between approximately 30% to 40% of times across all three contexts, i.e. always around chance. However, these subtle differences are not significant. We only observe the same significant contrast between the two contexts 'No Extra Attention' and 'Attention to Unique Toy'. The selection of the toy depends on which one is made salient. The percentages in Figure 4.5 show that adults act at chance level in picking the unique toy both when hearing the definite and indefinite article when nothing is made salient (see

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[5]In addition to the GLMM and in order to assess whether the relative frequencies in the context conditions (irrespective of CONSTRUCTION) deviate significantly from chance, we computed the confidence intervals for each context condition in each group. If the logit-transformed guessing probability of one third (transformed: –0.693) lies beyond the confidence interval, we consider the frequency to differ significantly from guessing.
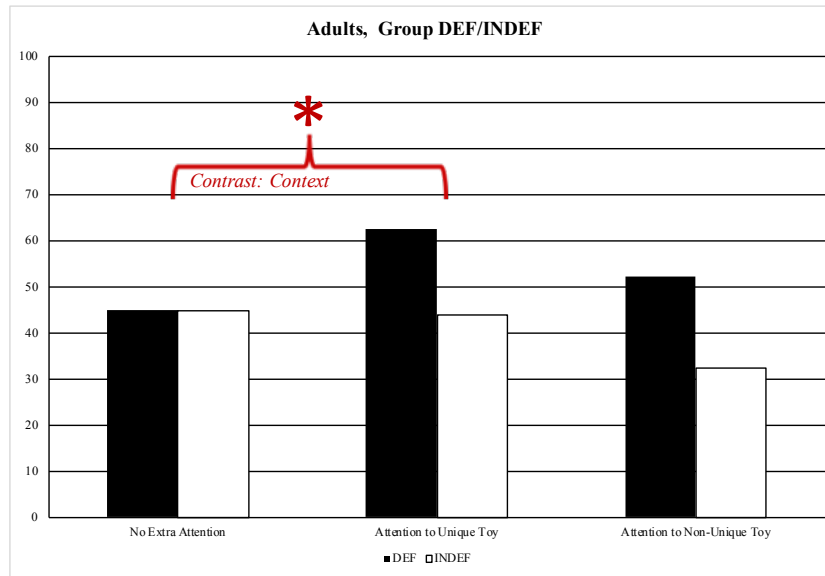
Figure 4.5: Results: Percentage of Selection of Unique Toy, Adults, Group DEF/INDEF

the black and white columns on the leftmost side). When one of the two non-unique toys is made salient (see the black and white columns on the rightmost side), adults pick the unique toy even less when hearing the indefinite article, while picking the unique toy more often when hearing the definite article. However, again, this interaction is not significant. In the 'Attention to Unique Toy' context, the percentage of picking the unique toy increases when the unique toy is made salient and the definite article is used, while the percentage of picking the unique toy when hearing the indefinite article stays roughly the same as in the 'No Extra Attention' context. Overall, the contrast between the 'No Extra Attention' and the 'Attention to Unique Toy' context is significant ($p = 0.0417$; z-value = 2.036; SE = 0.3752), probably mostly guided by the increase in the case of the definite article.

The lack of a significant interaction in the adult data might be due to considerable differences in the behaviour of the individual participants, suggesting that they were unsure about the task. Together with the adults failing to pick the unique toy across contexts when the definite is used, it is possible that our material was not adequate to test the difference between the definite and indefinite article. This explanation is even more plausible when

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considering that adult's choices did not improve with changing the material. This lack of improvement comparing the original adult sample and the follow-up sample suggests that we cannot verify or falsify our hypotheses about children's sensitivity to the uniqueness presupposition of definites. The overall lack of a construction effect thus could still either mean that three-year-olds are not sensitive to the uniqueness requirement of definites, or that our task is not able to detect their and adults' sensitivity.

Results Group 2: Definite Article vs. Pronouns (DEF/PRO)

Overall, the results from group DEF/PRO matched our expectations. Children pick the salient toy more often when hearing a pronoun than when hearing a definite (see Figure 4.6).
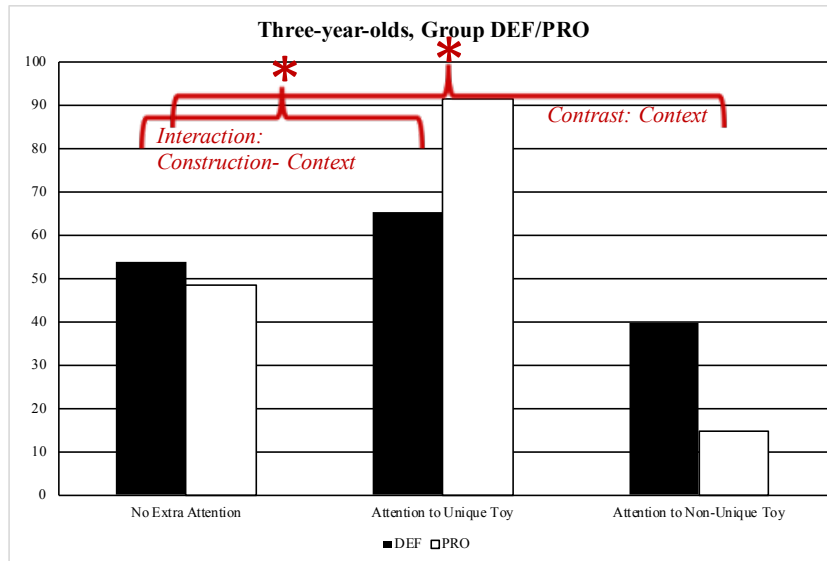
Figure 4.6: Results: Percentage of Selection of Unique Toy, Children, Group DEF/PRO

First, there is a significant contrast between the 'No Extra Attention' context and the 'Attention to Non-Unique Toy' context ($p = 0.041$, z-value $= -2.04$, $SE = 0.53$). In the former, children generally pick the unique toy more often than in the latter. This is to be expected because at least in the pronoun case in the 'Attention to Non-Unique Toy' context, children only pick the unique toy 15% of the time, because it is not the salient toy. When Froggy uses the definite article in this context, children are still at chance in picking the unique

toy. In the 'No Extra Attention' context, children are significantly above chance in picking the visually unique toy both when they hear the definite article and the pronoun 'it'. Comparing the 'No Extra Attention' context and the 'Attention to Unique Toy' context, we find a significant interaction between context and construction ($p = 0.035$; z-value = 2.11; $SE = 0.82$). The percentages of children picking the unique toy when hearing the definite article (the two black columns on the left and in the middle) differ slightly across the two contexts. In other words, the additional contextual manipulation of making the already visually unique toy salient increases their choice for the unique toy slightly when hearing the definite article. However, it increases considerably when they hear a pronoun (see the two white columns on the left and in the middle). This finding is compatible with our expectations. Only when the visually unique toy is made salient it is the appropriate referent for the pronoun. When nothing is made salient, there is also no appropriate referent for the pronoun.

The adult data for group DEF/PRO yet again looks promising (see Figure 4.7). Again we observe a significant interaction between the 'No Extra Attention' and the 'Attention to Non-Unique Toy' context regarding context type and construction ($p = 0.006$, z-value = -2.729, $SE = 0.64743$). Adults, as three-year-olds, pick the salient toy more often when a pronoun is used as when the definite article is used.
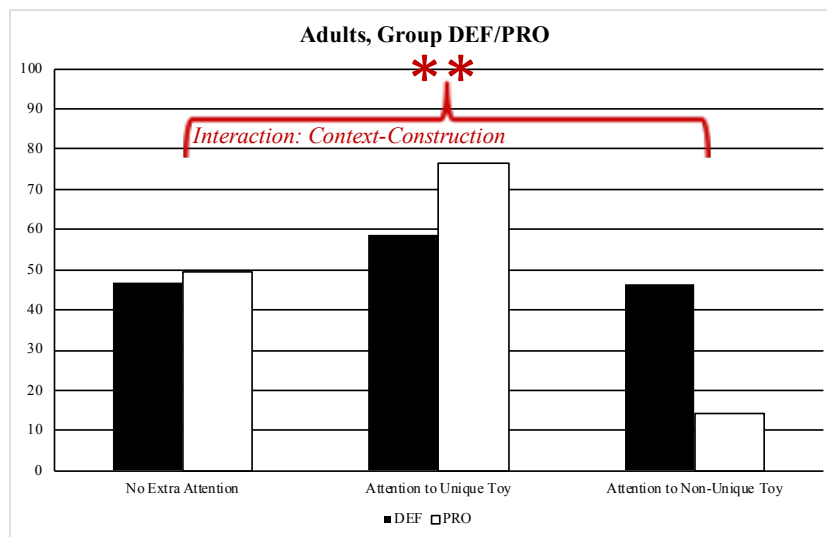

Figure 4.7: Results: Percentage of Selection of Unique Toy, Adults, Group DEF/PRO

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Specifically, in the 'No Extra Attention' context, adults are at chance level in picking the unique toy both when they hear a definite article and a pronoun (see the two leftmost columns, black for the definite article, white for pronouns). In turn, when one of the two non-unique toys is made salient (two rightmost columns), their selection of the unique toy decreases only when they hear a pronoun. Adults almost never pick the unique toy when they hear a pronoun and the salient toy is one of the two non-unique toys (about 10% of the time, see the rightmost white column). However, they are still at chance level in picking the unique toy when they hear the definite article (see rightmost black column). In the 'Attention to Unique Toy' context, adults are clearly above chance level in picking the unique toy in both cases, so when the definite article is used (black column in the middle) and when a pronoun is used (white column in the middle). The percentage in the pronoun case is slightly higher. Overall, the results of the adult sample match our expectations, as well.

4.3 Discussion

In sum, the results of our experiment suggest that three-year-olds are adult-like in their comprehension of the salience requirement. Salience (defined here as the experimenter's attention to one of the available toys) guides the children's choice when they hear a pronoun, but less so when they hear the definite article. However, in terms of the hypotheses in (4.2) and (4.3), no clear conclusion can be drawn, as we do not know whether children's lack in differentiating between the definite and indefinite article is due to their knowledge about the contextual requirements associated with them or due to the experimental setup. Moreover, surprisingly, the children's behavior is mirrored by the choices made by the adult controls who failed to pick the unique toy when hearing a definite article and failed to pick at random when hearing the indefinite article. Changing the material to prevent type/token confusions did not alter children's or adults' responses.

Four additional factors could play a role for making the material potentially inadequate according to test for uniqueness, especially with adults. First, the toys represented on the cards are objects existing in the real world. While these should be unusual enough for children, adults clearly know a majority of these objects and their names. This alters the experiment, even though the experimenter makes clear that Froggy is a funny guy

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who has his own names for these toys. Still, just by virtue of the toys being known to the adults, their reasoning could be different in that they might wonder which connection there could be between the object, its real world name, and its fantasy name. In other words, while a novel word task is quite natural for young children, it may be unnatural for adults, especially if the objects are familiar. If they reason this way, then the grammatical input of the definite article or the indefinite article becomes less important. This extra-linguistic factor could only be excluded if we would present them with truly novel objects. We leave this manipulation for future research.

Second, a basic problem with the set-up of the experiment could lie in the disregard of familiarity. We have excluded the requirement of familiarity from this study, as both pronouns and the definite article require their referents to be familiar. However, all the toys in the experiment are unfamiliar to the child and they are only established as familiar through drawing attention to them. Thus, especially in the 'No Extra Attention' context, introducing the toys visually could be insufficient to establish familiarity, and thus referring to the unique toy with the definite article might seem odd in the first place. This factor could influence the choice in the 'Attention to Non-Unique Toy' context, where the visually unique toy might not be familiar on the basis of the visual situation alone, and thus could be disregarded as a competitor for the salient toy. However, results of previous studies (e.g., van Hout et al., (2010,[57])) show that the visual context makes a referent familiar in guiding children's interpretation.

Third, this experiment raises the issue of testing uniqueness in the first place. Clifton (2013,[23]) reports on four experiments with adult participants using a reading time and eye tracking paradigm. Similar to the visual setting of our experiment, they presented the participants with a context where uniqueness can be inferred or not, followed by the use of the definite or indefinite article.

(155) In the kitchen, Jason checked out {the stove/ $^{??}$a stove} very carefully. (see Clifton (2013,[23]), appendix)

(156) In the appliance store, Jason checked out {$^{??}$the stove/ a stove} very carefully. (see Clifton (2013,[23]), appendix)

In the example target item in (155), the initial PP contributes to a situation where there is usually one uniquely available stove. Using a definite DP 'the stove' should thus be

appropriate, while using an indefinite DP 'a stove' should be dispreferred. In (156), the setting is reversed. The initial PP suggests a situation where there is more than one stove available. Here, using a definite should be inappropriate, while using the indefinite is fine. These initial PPs which set the scene fulfill a similar job as the visual setting in our experiment. They either do or do not establish one unique object as the possible referent for the definite or more than one referent for the indefinite. The difference between a match or mismatch of type of article and situation should be reflected in reading times. Participants should take longer to read the mismatch cases. This effect should also be observed in eye-tracking measures. However, Clifton (2013,[23]) finds that a difference can only be observed if the reading of the target sentences is followed by an arithmetic task. Without this secondary task, no significant effects arise, neither in reading times, nor in eye-tracking measures.

In light of Clifton's (2013,[23]) results, we can conclude that empirically testing uniqueness in general is indeed possible. However, the observable effect of uniqueness seems to be very subtle and can only be achieved if increased attention to sentence comprehension and processing is established in the experiment. In the case of our experiment, participants were not made sensitive to the content of the sentence but rather, by concentrating on the form of the fantasy word, disregarded the grammatical surroundings of it. In contrast, testing salience in group DEF/PRO resulted in findings which matched our expectations. This difference is in line with other psycholinguistic studies on pronominal reference violations which resulted in slower reading times without a secondary task (see e.g. Ehrlich and Rayner (1983,[29]). Thus, violating different contextual requirements might not be treated equally in language comprehension and/or processing. In the case of indefinites or definites, for example, the situation can quite easily be accommodated so that the kitchen contains more than one stove or such that the appliance store comes with only one stove.

The fourth factor could be the binary comparison of the definite and indefinite article. In this experiment and in van Hout et al (2010,[57]), the results have been looked at from the perspective of definiteness, i.e. interpreting the results to mean that children do not know when it is appropriate to use the definite article. However, a possible alternative explanation could result from looking at the findings from the perspective of indefiniteness, i.e. interpreting the results such that children do not know when to use the indefinite article, while being adultlike in their comprehension and use of the definite article. If we were to

look at the results from the perspective of indefiniteness, the following interpretations for the experiment in chapter 4 could arise. In the context where nothing is made salient or where one of the two non-unique toys is made salient, children fail to pick the unique toy more often than chance when hearing the definite article. This could be due to the way the situation is set up. Visual uniqueness alone could just be insufficient in establishing the unique toy as the uniquely available referent for the definite article. This lack of suitable uniqueness is abolished in the context where the unique toy is made salient. Here, visual context and the attention of the experimenter make the unique toy sufficiently unique and children are indeed on target when hearing the definite article.

What about the indefinite? In the 'No Extra Attention' and 'Attention to Non-Unique Toy' context, we expect participants, and especially the children, to pick at random, as it is not clear if they are sensitive to the scalar implicature arising for the comparison of the definite and indefinite article, resulting in a preference for the non-unique toy in either context (see for more details the discussion in chapter 4, section 4.2.5). And indeed they are at chance level in picking the unique toy. However, this finding cannot really say if this is due to their linguistic ability or if children just do not have any clue about the indefinite article and just pick any toy irrespective of the linguistic input. Now, in the context where the unique toy is made salient, participants behave contrary to what we expect for the indefinite article. They are above chance in picking the unique toy. This finding is not in line with either children being sensitive to the scalar implicature or not - on the contrary. Their choice suggests a different strategy altogether. As a consequence, we could interpret the findings such that children do not know what the indefinite means and by lack of any other linguistic strategy, they pick the salient toy, just by virtue of its being made salient, irrespective of the meaning of the indefinite article.

Is this interpretation plausible? If we have a look at the theoretical distinction between definite and indefinite article again, the only characteristic that puts forward a binary comparison in the first place is their behaviour regarding familiarity (see chapter 2, section 2.1.1). Following from the discussion in section 2.1.1, indefinites follow the novelty condition, i.e. they refer to newly introduced discourse referents, whereas definites require familiar referents. However, other than that comparison, indefinites and definites are quite different specimen of linguistic objects. Definites are referential in most cases and trigger the presuppositions of uniqueness and familiarity. Indefinites are interpreted as quantifiers

with a different semantic type than the definite article. We see in (157) that it takes two properties as arguments and returns a truth-value.

(157) $[\![a]\!]^{g,c} = \lambda P_{<e,t>}.\lambda Q_{<e,t>}.\exists x[P(x)\&Q(x)]$ (Heim 2011,[53]: 1000,example (10))

As a consequence, the cognitive and linguistic prerequisites for a language learner are quite different for definites compared to indefinites. For indefinites, children need basic abilities of numerosity, i.e. they need to comprehend basic relations between sets. Furthermore, they also need more advanced syntactic abilities, as quantifiers can be subject to quantifier raising, leading to different readings of sentences with quantifiers (see Lidz (2016,[70]) and references therein for an overview). These are quite different language abilities than the ones identified for the definite article in chapter 2, section 2.2.1, especially considering the young age of children tested in Chapter 3 and 4. Lidz (2016,[70]) reports studies that suggest that children understand approximate number and set representation early, while knowledge about precise numbers takes more time. Regarding the syntactic knowledge required for scope ambiguities, Lidz (2016,[70]) reports that preschoolers have the necessary syntactic and semantic abilities but may be more strict in revising initial readings of a sentence.

Thus, in the case of indefinites, much more linguistic competence is required than being able to distinguish between discourse new and old referents[6]. On the contrary, the indefinite comes with its own acquisition problems. Future studies that make use of a binary comparison between definites and indefinites have to carefully consider if their material targets the familiarity/novelty-difference exclusively or if the study taps into additional complexities for the indefinite independent from the definite-indefinite duality[7]. The default assumption that indefinites should be preferably mapped to non-unique referents is oversimplifying at best and might not do justice to the complexity of and the different uses

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[6]for example, an additional complexity for an interpretation of the indefinite is its ambiguity between a specific and nonspecific reading, see Fodor and Sag (1982,[38]), Enç (1991,[33]), von Heusinger (2002,[55]; 2011,[56]) and Farkas (2002,[34]) report on other, scopally independent specificity/nonspecificity readings of indefinites in other languages and possible analyses of these. See also van Heusinger (2011,[56]) for a handbook overview.

[7]For a more indepth theoretical comparison between the definite and indefinite article and an analysis where both are derived from the same core meaning and receive a definite or quantifier-like meaning through type-shifting principles, see Coppock and Beaver (2015,[25]). Studies that take into account the compexity of the indefinite, see ongoing research on the definite/indefinite distinction in language processing by Nadine Bade within the XPrag.de-Project 'ObTrEx'.

there are of the indefinite article, e.g. as a quantifier, or marking specific or unspecific individuals. Here, more indepth and formally informed predictions are necessary regarding the specific behaviour of the indefinite article.

To sum up, testing uniqueness requires more subtle tasks than the one presented here. Still, we cannot be sure that the lack of effect has the same origin in adult and children comprehension, i.e. it could still be the case that children lack the sensitivity to uniqueness altogether while the task did not target adults sensitivity in the first place.

4.4 Interim Summary: Comprehension Study

This experiment served two main goals. First, it payed special attention to the core pragmatic meaning components for definites and pronouns in contrast to the previous production studies. Secondly, it tested children's comprehension of the construction and not their production. These reasons establish this experiment as neccesarily complementing the previous chapter.

Overall, we have seen that children and adults show difficulty with the definite article, but none with pronouns. If we could exclude external factors, as for example the design of the study, this finding would suggest that the core pragmatic ingredients are at place for pronouns, while they are not necessarily at place for definites. However, external factors can not be excluded in this experiment as influencing the interpretation of the definite article, especially in comparison to the interpretation of the indefinite article. Instead, the lack of difference in the behaviour of children and adults regarding the definite and indefinite article rather contributes to an overarching issue, namely how to experimentally test uniqueness. It has turned out here that a more subtle measure is necessary.

Chapter 5

Conclusion

5.1   Overall Summary

In light of the general aim of this dissertation to gain further insights for the combination of a formal analysis of pronouns and definites and language acquisition, the present endeavour has shown that specific predictions do indeed follow from the analysis.

In chapter 2, I have identified three research questions as a guide for this dissertation, repeated below in (159) to (160).

(158)   Is the interpretation of pronouns dependent on the interpretation of definites?

(159)   Does the acquisition of pronouns depend on the acquistion of definites or vice versa?

(160)   How does the acquisition of the presuppositions of pronouns and definites proceed?

Asking these research questions is a means to tackle the relation between pronouns and definites regarding their theoretical analysis, their acquisition and the interaction between theory and acquisition. Two competing analyses were introduced in chapter 2, the uniform view and the classical view. In the uniform view, pronouns are analysed as definites in disguise, i.e. they operate on an implicitly given NP complement. The presupposition of uniqueness guides the choice for a suitable referent in the discourse. This analysis can be extended to indexical pronouns and demonstratives (see chapter 2, section 2.1.2). In contrast, the classical view analyses pronouns as variables that are mapped to discourse

referents by way of the variable assignment g, whereas the uniqueness presupposition guides the interpretation of the definite article and demonstratives (see chapter 2, section 2.1.1).

Chapter 3 reported on two studies of children's production of the definite article, third person, indexical pronouns and demonstratives in English and German. The main finding is that at first glance, the time frame when these constructions first come online is very short, especially in the English corpora. All constructions are first produced within a time frame of only one to three months. However, in the German data, the time frame is three to ten months. Yet, when we have a look at the individual orderings of when the constructions come online, no recurring pattern across corpora can be observed. In other words, the time course of first production of pronouns does not depend on the time course of first production of definites, and vice versa. Instead, we find intervariation between the corpora regarding the order of production of pronouns and definites. Thus, these data suggest that the answer for research question (159) should be no, the acquisition of pronouns and definites within language production is not interdependent, meaning that the production data failed to find any support for a uniform analysis of pronouns and definites. This finding directly contributes to research question (158). The evidence presented here calls into question whether the interpretation of pronouns and definites should be dependent on each other, when the data here did not provide evidence in favor of such a view. In turn, the classical view is compatible with intervariation in children's data. Future additional studies within language acquisition and other empirical sources have to add to the findings presented here in order to arrive at a more conclusive answer for (158).

Regarding research question (160), the time course of production within the two groups pronouns and definites revealed that the individual pronouns 'he' and 'she' (and their German couterparts) are indeed not produced significantly earlier than 'it'. This suggests that the integration of additional presuppositions matters in first language production and that the internal build-up of the pronominal structure indeed increases subsequently over time. The same can not be said for definites. Here, demonstratives and definites demonstrate intervariation of which constructions is produced first.

Chapter 4 serves as the necessary counterpart to Chapter 3 in that here, an experiment on children's comprehension of pronouns and definites was conducted. The experiment focused on the core pragmatic meaning components of pronouns and definites and thus

also directly contributes to research question (160). Here, the experiment did not so much aim at differentiating between the uniform and classical view, but it rather asked how the additional contextual requirements needed in both groups are understood by three-year-old children. The findings suggest that three-year-olds are indeed already sensitive to salience in their comprehension of pronouns, but it is unclear if they are sensitive to uniqueness in their comprehension of definites or if the material was not fit to test their sensitivity successfully. The second option is further supported by the lack of sensitivity towards uniqueness in the adult control groups. Still, these different outcomes for pronouns and definites regarding their pragmatic meaning components contributes to the insight that presuppositions are to be seen as a heterogeneous class.

Overall, this dissertation contributes to the duality of formal theory and empirical evidence by investigating how language acquistion data can contribute to a further understanding of the lingusitic analysis of pronouns and definites, and thus, by extension, to a further understanding of the semantics-pragmatics interface. Although no conclusive answer can be given at this stage about which analysis 'is right', the data presented here provides information about the complex interplay of syntactic, semantic and pragmatic meaning components of definites and pronouns and a thorough investigation of which role these components play in language acquisition. In other words, this work shows which consequences a purely theoretical binary opposition of two formal approaches has when considering the complexity of the analyses of definites and pronouns on the one hand and the resulting complexity of the acquisition process on the other hand, and thus it has also been shown that language acquisition serves as a rich data source to investigate these predictions.

5.2 Implications and Open Questions

In the following, I want to focus on three main issues arising from the thesis: the first issue perspectivizes the findings of chapter 4 in light of more general observations on presupposition triggers, treating them as a heterogenous class. Second, I want to point to possible follow-up studies to the comprehension study in chapter 4 and the production study in chapter 3, providing further evidence for the research questions of this dissertation. Finally, I comment on how to connect the present findings to crosslinguistic evidence.

5.2.1 Heterogeneity of Presupposition Triggers

I have shown in the discussion in Chapter 4 that the reading time and eyetracking data in Clifton (2013,[23]) suggest that even with adults, testing for uniqueness requires an experimental setting where special attention to the processing or comprehension of the sentence is guaranteed (see the discussion in chapter 4, section 4.3). A uniqueness effect was only achieved by implementing a secondary, arithmetic task. As a consequence, an overall question with respect to our results regarding uniqueness is the following. Why do salience and uniqueness not pattern alike? I.e. why is it that our experiment was suitable for testing salience, but not for uniqueness? Our results do not show an overall lack of effect, but only a lack of effect for uniqueness. A necessary consequence is that even though both salience and uniqueness have been modelled as presuppositions, they cannot be experimentally tested in the same way. This finding contributes to the longstanding observation that presupposition triggers are a heterogenous class and that there is a need to further classify them (see also Tonhauser et al. (2013,[116])). This heterogeneity has been explained with the help of different means that more or less all try to explain why in some cases where the context does not meet the restriction captured by the presupposition, this mismatch can quite easily be resolved, i.e. accommodated, while this accommodation process is not available in other cases. For example, Abusch (2002,[1]) observes that 'too' triggers the presupposition that what is described in the sentence is equally the case for something else. For example, in (161), the context necessarily has to provide the information that somebody else is writing their dissertation other than myself, Saskia.

(161) I am writing my dissertation, too.

(162) John will either attend the first meeting, or miss it.
       a.) # And he will either attend the second meeting too, or miss the second meeting too.
       b.) And he will either continue attending meetings, or continue missing them.

Regarding the accommodation behaviour of 'too', Abusch (2002,[1]) observes that continuing the introductory sentence in (162) with a sentence where the presupposition triggered by 'too' can be locally accommodated is still bad, i.e. the information provided by the context, namely that John missed indeed the first meeting, is locally met by the first disjunct

in the introductory sentence, and vice versa for the second conjunct. In contrast, using the verb 'continue' is fine in the same context. Thus, 'continue' allows for accommodation while 'too' does not. This difference of accommodation behaviour has been explained differently in various accounts (see e.g. Abusch (2002,[1]), Glanzberg (2005,[44], Zeevat (1992,[120]), Sudo (2012,[113])).

Beaver and Zeevat (2007,[8]) note that pronouns and demonstratives generally do not allow accommodation, whereas long definite descriptions do. Accommodation in definites has been observed in bridging contexts where, even though the context does not provide a unique referent, a referent can still be quite easily inferred from the situation.

(163) Every time we step in an elevator, the music soothes us. (Beaver and Zeevat (2007,[8]): 532, example (41))

(164) # Every time we step in an elevator, it soothes us.

In (163), the uniqueness of 'the music' can be accommodated through the fact that usually, in an elevator, there is music playing. To demonstrate the point that in the case of pronouns, the same accommodation process is not available, see (164). The elevator context does not provide a salient referent for 'it', even though 'it' could refer to the music.

To summarize, previous literature has identified presuppositions as a heterogenous class. Further subdivisions are defined according to their ability to allow accommodation. The definite-pronoun comparison contributes to this picture, such that definites allow for accommodation, while pronouns do not. However, the question remains why this difference exists in the first place and why the experiment in chapter 4 established sensitivity to salience in the case of pronouns, but no sensitivity to uniqueness in the case of definites.

Geurts and van der Sandt (2001,[42], 2004,[43]) have proposed that the lack of descriptive content in the case of pronouns blocks accommodation. However, Beaver and Zeevat (2007,[8]) argue that this explanation cannot account for other presupposition triggers, as for example 'too'. I want to propose another aspect that might contribute to the difference of the salience and uniqueness presupposition, namely how clearly the context can meet the requirements. While the experiment in chapter 4 clearly establishes that the salience presupposition of 'it' is met by the experimenter's attention to one of the three toys, uniqueness is not as clearly established. Even though the visual situation provides one unique toy, this visual uniqueness can be easily overriden by attention. I.e., when

the experimenter draws attention to a non-unique toy, this attention can have the effect of the participant reevaluating what uniqueness means - here, the participant's interpretation could change from visual uniqueness to uniqueness due to the focus of the experimenter. Alternatively, a nonstandard way to establish uniqueness could be to pick the toy which is unique because it is the uniquely preferred toy, or because it is the toy which uniquely fits best with the phonological pattern of the fantasy noun. In other words, the definition of which discourse referent counts as unique is subject to a lot more variation than the definition of what counts as salient. And, importantly, this variation has not - and maybe cannot - be accounted for by linguistic theory itself, because it necessarily includes the interpretation of the extralinguistic situation. For salience, computerlinguistic and psycholinguistic studies (see e.g. Ariel (1988,[2]), Grosz (1977,[45]), and Hudson-D'Zmura and Tanenhaus (1998,[60])) have found usable extralinguistic parameters which can be integrated into a linguistic theory of salience, as proposed by Roberts (2005,[94]). However, similar investigations on how uniqueness is established have not received the same attention. Rather, psycholinguistic studies have presupposed one way of reading uniqueness without seeing if this is the most plausible interpretation - and the study in chapter 4 is the best example, as it presupposes that visual uniqueness will serve as the only prominent instance of uniqueness. As a consequence for semantic and pragmatic theory, maybe next to looking at the different patterns of certain presupposition triggers, a thorough investigation of the presuppositions themselves should follow, where careful attention is spent on how certain we are that a linguistic or experimental setting even establishes these presuppositions or not. Further empirical and theoretical work, and especially work integrating both fields, needs to be done.

5.2.2 Possible Directions for Future Studies

Follow-Up Study to the Comprehension Study in Chapter 4

As the experiment in Chapter 4 failed to successfully test uniqueness, we are in need of further manipulating our study, so that the task can access participants' sensitivity towards uniqueness. Still, the material should be set up in such a way so that a uniquely identifiable and familiar discourse referent can be targeted by the definite DP without its NP complement giving away too much information about the referent. Additionally, the task has to

make sure that both children and adults are specifically paying attention to the content of the target sentence. The latter point is problematic, as it is unclear which manipulation would guarantee a deeper processing or comprehension of the sentence and which at the same time is appropriate for children. Clifton (2013,[23]) showed that for adults, an additional arithmetic test was adequate, but it is unclear why and if other manipulations could have the same effect.

However, for the comprehension task in chapter 4, several manipulations could facilitate testing children's and adults' comprehension of uniqueness. First, I have discussed in chapter 4 that one weakness of the material could be that the toys presented are not established as familiar by the purely visual context alone. To make the toys even more familiar, we could integrate an additional sequence into the experiment at the beginning where all of Froggy's toys are put on the table, and where of each type of toy, there are several tokens. Then, the experimenter and the child look at them for some minutes and name them, crucially by not using definites, indefinites or pronouns. Instead, the experimenter could use a quantifier like 'Look, Froggy has so many blickets!'. With this addition, children have seen the toys once before they are confronted with them in the experimental trials, thus establishing even clearer familiarity.

Second, regarding children's attention towards the sentence meaning, a more extensive manipulation could be to abandon the fantasy nouns altogether and instead exchange them with noise. In the experiment, children are told that they will skype with Froggy. In a skype talk, it is quite natural that reception be bad and some of the information might be lost. As all children did not have problems with the Skype situation, it is probable that they will understand that the internet connection is bad. So, the experimenter could just say that they would skype with Froggy, but that the reception at his grandmother's house is quite bad and that we have to really pay attention to what Froggy is saying. Then, for the target sentences, Froggy could give the clue, but instead of the fantasy word, children hear noise, so that the only clue is the use of the definite article or indefinite article - counterbalanced with Froggy using the pronoun 'it' in the DEF/PRO group (see (165) for an exemplary target item).

(165)   Froggy: Put a/the [*noise*] in the suitcase!

Control conditions could be added where the whole DP is noise (e.g. 'Put [*noise*] in the

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suitcase!'). These could replace the control condition in the current version where Froggy lets the participant decide which toy to pack. Additionally, these noise-conditions would have to be counterbalanced with filler items where Froggy actually names the toys. Here, real toys could be used with their actual names. Consequently, with this setting, we do not need to include fantasy names and weird toys at all - because the children do not hear the actual name of the toy, we can use real toys. Using real toys also might improve adults' behaviour, as their reasoning cannot be about the possible relation between the fantasy word and the name of the object in reality anymore. Thus, this manipulation might improve both children's and adults' responses. Furthermore, due to the bad reception, participants are asked to pay specific attention to the sentence. This manipulation could succeed in providing the necessary depth in processing that Clifton (2013,[23]) observed. Together with actual toys, the additional sequence in the beginning, where the experimenter familiarizes the participant to the toys, is even more natural.

Integrating these two main changes could indeed alter children's and adults' responses. I hope this will be tested in future studies.

Follow-Up Study to the Production Study in Chapter 3

We have seen that a definite answer for research question (158) can not be conclusively given. Another way to test (158) is to go along Elbourne's (2013,[32]) assumption about the processing and production of pronouns under a uniform view (see chapter 10 in Elbourne (2013,[32])). Elbourne suggests that psycholinguistic evidence could possibly test whether for the processing of pronouns, explicit reference has to be made to a linguistic antecedent[1]. In other words, do native speakers activate the NP 'Junior Dean' when processing 'he' in the second sentence in (166) below?

(166)   I saw the Junior Dean. He was worried about the Bollinger dinner. (Elbourne (2013,[32]: 224, example (115))

In terms of language acquisition, a more specific research question following up on (158) and thus on the results from Chapter 3 would be if the processing of a pronoun for children

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[1]Elbourne (2013,[32]) cites several studies in syntax/semantics, morphology and phonology where such a reasoning has been tested, see Shillcock (1982,[105])), Garnham et al (1995,[40])and Schmitt et al (1999,[102]).

would proceed quicker when an overtly given NP antecedent is present as opposed to when this is not the case. This could be tested by measuring children's reaction times.

Specifically, reaction times of three year olds could be tested in the following scenario. Children are playing a game on a tablet. The game is composed of short sequences of videos followed by a task. The game is shaped as a story: Lisa and Fred go to the same kindergarten and have been asked to collect interesting things from nature. So they go for a walk and notice things that could be suitable. They refer to these objects either by using an explicit description (as illustrated in (167)) or by pointing at it, without such a description (see (168)). The children's task is it to move the object into a backpack by drag-and-drop or by swipe-movement. The measurement then is the time it takes children to start the movement.

(167)   Condition: with overt NP-antecedent
        Video: Lisa and Fred notice a red and shiny maple leave.
        Fred: Lisa, look at this leaf!
        Lisa: Let's pack it in the backpack!

(168)   Condition: without overt NP-antecedent
        Video: Lisa and Fred walk past a beautful brown chestnut
        Lisa: Oh Fred, look at this! [points to the chestnut]
        Fred: Wow, let's pack it in the backpack!

The prediction under the uniform view is that it should take children longer to move the object when no overt antecedent is given. Under the classical view, the reaction times in both conditions should be the same, as the referent is equally salient in both cases.

Another direction for future studies would be to more closely test potential differences or similarities of deletion or ellipsis processes in general, e.g. VP-ellipsis. Tests or paradigms that have been used for the purpose of finding out more about these deletion mechanisms could be made to use for NP deletion as well and thus could test whether a pronoun is a case of NP deletion in the first place, by e.g. showing a similar pattern[2].

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[2]For an overview see Reich (2011,[91]), especially section 7 'Psycholinguistics' on pages 1870-71, where different psycholinguistic approaches to ellipsis in general are discussed briefly.

5.2.3 Crosslinguistic Comparison

The Production data in Chapter 3 revealed that English and German children differ in their production process of pronouns and definites. While in the English corpora, pronouns and definites are first produced within a very short time frame from one to three months, German children need up to ten months until all constructions are produced. The theoretical analysis for German was refined in order to account for the strong/weak distinction within the article system and, by extension in a uniform framework, within the pronominal system. The question arises whether this difference in time periods of first production arises because of the more complex compositional analysis of definites and pronouns or if it is because of the additional morphological differences within the German article and pronoun system. The analysis of the individual German corpora did not reveal a recurring pattern across corpora, such that strong articles or pronouns are produced significantly later than weak articles. Instead, there was intervariation regarding the order of first production. However, the study did not include contrated forms of the definite article ('im' instead of 'in dem' (English 'in the')). Thus, if we were to include those cases, maybe a recurring pattern within the article system can be observed after all. By comparing the German data with acquisition data of other languages that have been argued to have a strong/weak distinction, we could see whether it is the compositional complexity that adds to the time frame of acquisition or if it is the morphological system. Such a crosslinguistic endeavor would thus provide valuable insights for the more fine-grained theoretical distinctions not observable in English and their acquisition process. Next to German, Schwarz (2013,[104]) argues for a strong/weak distinction in Mauritian Creole, Lakhota and Hausa. Arkoh and Matthewson (2013,[3]) show that Akan demonstrates a similar distinction and Patel-Grosz and Grosz (2017,[85]) name additional languages where such a strong/weak distinction could possibly be extended to the pronominal system, e.g. Czech, French, Portuguese, Hebrew and Kutchi Gujarati.

5.3 Final Statement

The results of the comprehension and production study on the acquisition of pronouns and definites presented in this dissertation are relevant to both formal linguistic theory and

language acquisition. On the side of theory, they call into question in how far the uniform view is a plausible candidate for the target grammar, while the presence of the salience presupposition in the case of pronouns can be confirmed. On the side of acquisition research, the results provide a fine-grained picture of the acquisition process of definites and pronouns. Additionally, the thorough description of the formal analyses themselves alongside the newly developed analysis of the salience feature under a uniform view provide a detailed picture of the target grammar.

Appendix A

Appendix: Corpus Study English

List of first (of regular) Uses

- Pronouns: 'it'

(169) Naomi: fix it.
       Context: Naomi is playing with a doll and has just fixed her diaper. She
       refers to the diaper and says that she fixed it, so probably that she put the
       diaper on the doll.
       (1;10, n09)

(170) Naima: eyes, eyes on it.
       Context: Naima is referring to a CD where the eyes of the singer (Patty
       Larkin) are prominently to be seen.
       (1;6, nai18)

(171) Lily: uh uo it dried off.
       Context: Lily is playing with a Polly Pocket doll and a small water pond,
       but the pond has unfortunately already dried off.
       (1;11, lil24)

(172) Violet: this, it goes where?
       Context: playing puzzles, she talks about a puzzle piece.
       (1;9, vio16)

(173) Mark: I fix it.
       Context: Mark messed up his father's tape recorder and wants to fix it.
       (1;8, 43a2)

- Indexicals: 'I'

(174) Naomi: I get [the blanket].
Context:Naomi is playing with dolls and pretends to put them to sleep. That's why she needs a blanket for one of the dolls.
(1;10, n09)

(175) Naima: see, I wanna see.
Context: Naima is talking about spiders. She claims that she wants to see them.
(1;5, nai16)

(176) Lily: oh I draw right on the floor.
Context: Lily has drawn on the floor with a white crayon.
(1;10, lil21)

(177) Violet: I choose book.
Context: Mother asks Violet to pick out a book to read.
(1;8, vio14)

(178) Mark: I help.
Context: Mark wants to help his father.
(1;5, 38b2)

- The definite article: 'the'

(179) Naomi: baby on the floor.
Context: Naomi is playing with her dolls and one doll is on the floor.
(1;10, n14)

(180) Naima: I'm on the floor.
Context: Naima is on the floor, playing with crayons, while her parents talk.
(1;4, nai11)

(181) Lily: in the garbage.
Context: Lily's mother wants her to through away a dirty shirt.
(1;10, lil22)

(182) Violet: here is the mouse.
Context: playing puzzles, she identifies the piece with the mouse on it.
(1;9, vio16)

(183) Mark: I pushed the button.
Context: Mark reaches the button on the door, probably the doorbell.
(2;6, 52a2)

- Demonstratives: 'this'

  (184) Naomi: read this.
         Context: Naomi wants to read a catalogue that is right next to her.
         (1;10, n15)

  (185) Naima: this says...
         Context: looks at a bokk and is wondering about the title.
         (1;5, nai17)

  (186) Lily: this is Daddy's tie.
         Context: She is playing with her Daddy's tie.
         (1;10, lil21)

  (187) Violet: what is this mama?
         Context: Looking at a children's book, she wnats to know what kind of animal is on the page she's looking at.
         (1;9, vio15)

  (188) Mark: this is Wompa.
         Context: Naming his toys.
         (2;4, 49a2)

Error List: Selection

- 'it' in combination with an overt NP complement (only Naomi-corpus, just one instance overall in the Lily corpus):

  (189) Naomi: *Need it jacket.
         Context: Naomi wants to put her jacket on.
         (1;10, n09)

  (190) Naomi: *Nomi drop it the ice.
         Context: Naomi is playing with ice outside.
         (1;11; n22)

  (191) Lily: *And I use it potty, too.
         (2;2, lil34)

- feature errors:

  (192) Naima: *Juice me want.
         (2;1, nai44)

(193)   Naomi: *Him have eye.
        Context: Naomi is talking about a toy dog that has just one eye.
        (2;0, n38)

(194)   Naomi: *He fall down.
        Context: Naomi talks about a kitty, which is identified through the context
        as female.
        (2;0, n38)

(195)   Naomi: *Gonna put it on my floor.
        Context: She peels an orange and doesn't know where to put the peels. She's
        in the kitchen.
        (2;0, n35)

(196)   Naomi: *Is it gone?
        Context: Naomi talks about her father and if he's already gone to work.
        (1;11, n23)

(197)   Lily: *It heart.
        The operator asks her what is on a picture she shows Lily.
        (1;11, lil24)

- definite overuse:

(198)   Naima: *Squirrels eat the rocks.
        Context: Naima and her mother talk about what squirrels eat in general.
        (1;6, nai20)

(199)   Naomi: *Where's the Daddy?
        Context: Naomi talks about her father.
        (1;10, n14)

(200)   Naomi: *Here's the another one.
        Context: Naomi is outside, she finds two cigarette buds.
        (2;1, n47)

- 'you'-reversal (referring to child itself) (mostly in Naima-corpus):

(201)   Naima: *It's in your hand.
        Context: Naima herself has a puzzle piece in her hand.
        (1;8, nai28)

Complete List of AFP

	Lily	Naomi	Naima	Mark	Violet
I	1;10 (lil21)	1;10(n09)	1;5 (nai16)	1;5 (38b2)	1;8 (vio14)
you	2;1(lil28)	1;11(n33)	1;8 (nai28)	1;8 (43a2)	1;10 (vio18)
me	2;0(lil27)	1;11(n30)	1;8 (nai28)	2;6 (51b2)	2;0 (vio21)
my	1;11(lil24)	2;0 (n37)	1;6 (nai20)	2;0 (46a2)	1;10 (vio17)
your	2;0 (lil27)	2;4(n57na)	2;5(nai59a)	3;0 (56a1)	2;0 (vio21)
he	1;11(lil23)	1;11(n23)	1;8 (nai28)	2;1 (47b1)	2;0 (vio22)
she	2;2 (lil34)	2;5 (n62)	1;7 (nai23)	3;0 (56a1)	2;3 (vio26)
his	1;11(lil23)	2;0 (n32)	1;6(nai20)	2;10 (55a2)	2;1 (vio24)
him	2;5 (lil43)	2;5 (n62)	1;8 (nai27)	3;4 (59a1)	2;0 (vio22)
her	2;2 (lil35)	2;4 (n52)	1;7 (nai22)	3;6 (60a2)	2;0 (vio22)
it	1;11(lil24)	1;10(n09)	1;6 (nai18)	1;8 (43a2)	1;9 (vio16)
the	1;10 (lil22)	1;10(n14)	1;4 (nai11)	2;6 (52a2)	1;9 (vio16)
this	1;10 (lil21)	1;10 (n15)	1;5 (nai17)	2;4 (49a2)	1;9 (vio15)
that	2;0 (lil27)	1;10 (n20)	1;6 (nai19)	2;6 (52a1)	1;10 (vio17)
this one	2;0 (lil25)	2;1 (n43)	1;7 (nai22)	3;0 (56a1)	1;9 (vio15)
that one	2;1 (lil28)	2;3 (n55na)	1;7 (nai23)	3;1 (57a2)	1;9 (vio16)
this+NP	1;10 (lil22)	1;10 (n16)	1;7 (nai21)	2;4 (49b2)	1;10 (vio17)
that+NP	2;2 (lil35)	1;10 (n09)	1;7 (nai23)	2;4 (49b2)	1;10 (vio17)

Table A.1: Age of First Production (AFP), English Corpora, All Constructions

Construction	Lily	Naima	Naomi	Violet	Mark
I	2839	1762	2164	2696	1079
it	1642	1106	1884	1108	537
the	1867	899	4279	1996	978
this	934	898	1390	554	975

Table A.2: Raw Number of Tokens per Relevant Construction Overall (English Corpora)

Production Development: Graphs

Figures A.1 to A.5 demonstrate the increase in utterances of 'I', 'i', 'the' and 'this' per month. The numbers of utterances are given in permille rates, i.e. the mean number of utterances per 1000 utterances in a month (cf. Snyder (2007,[107])).
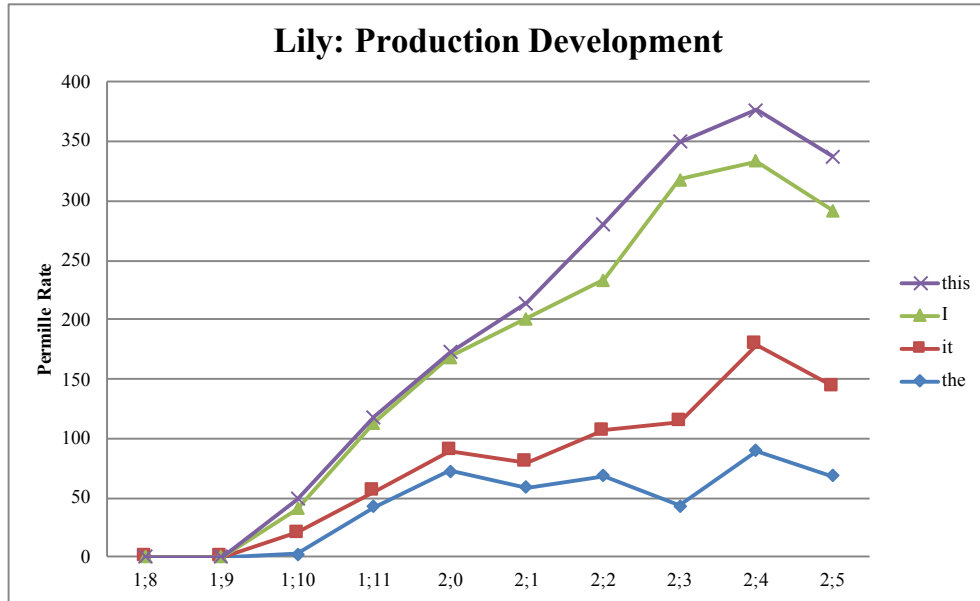

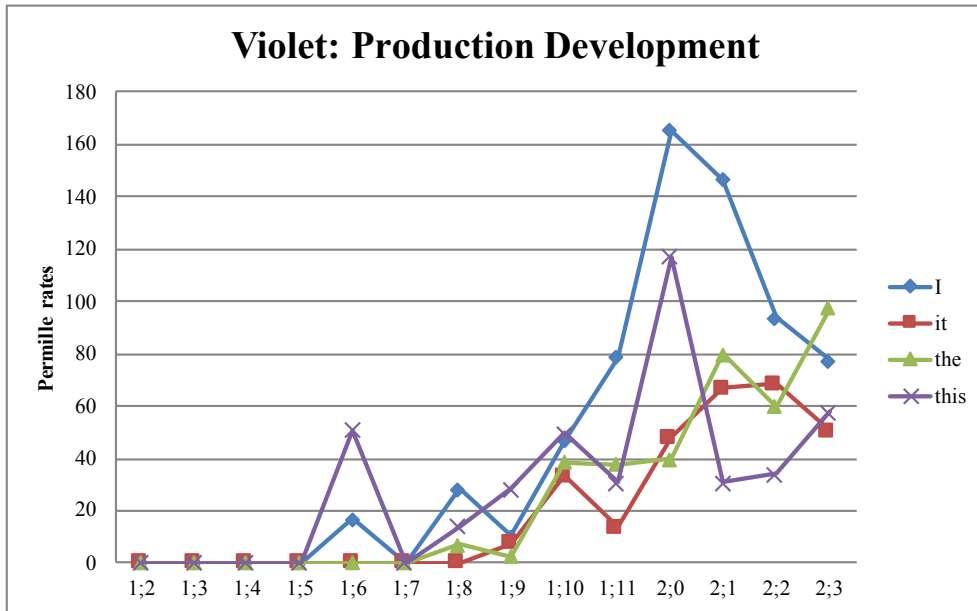Figure A.1: Production Development: Lily Corpus

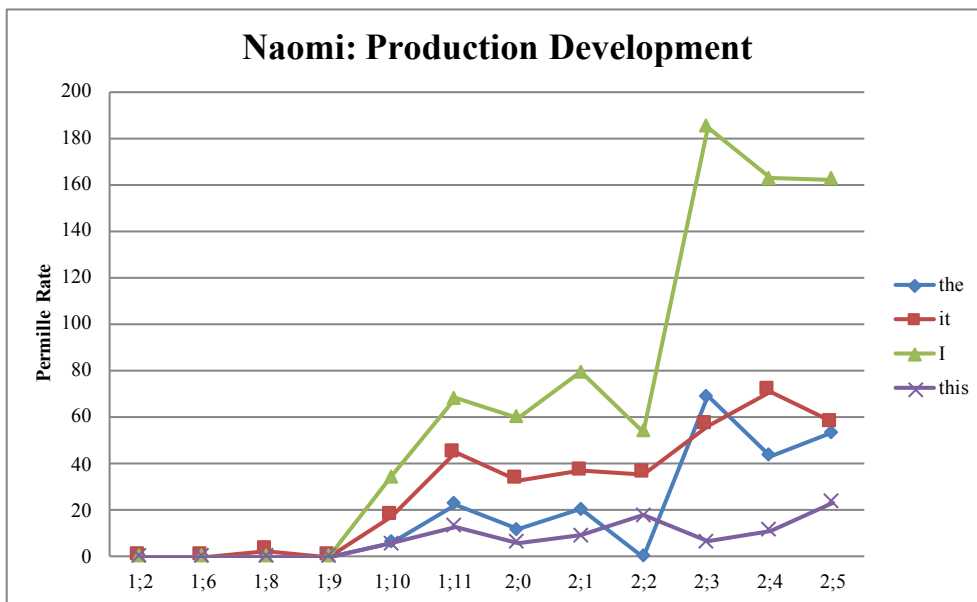Figure A.2: Production Development: Violet Corpus
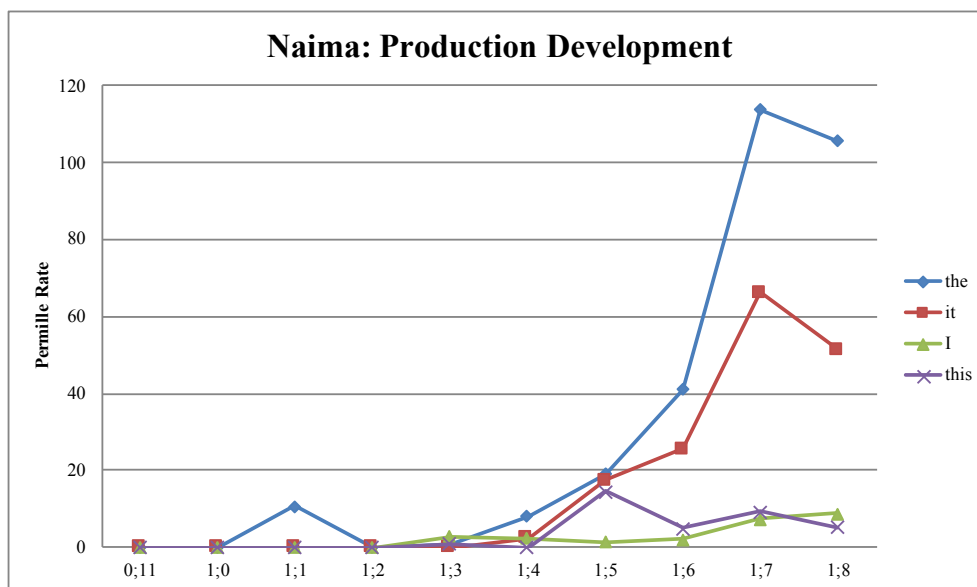

Figure A.3: Production Development: Naomi Corpus
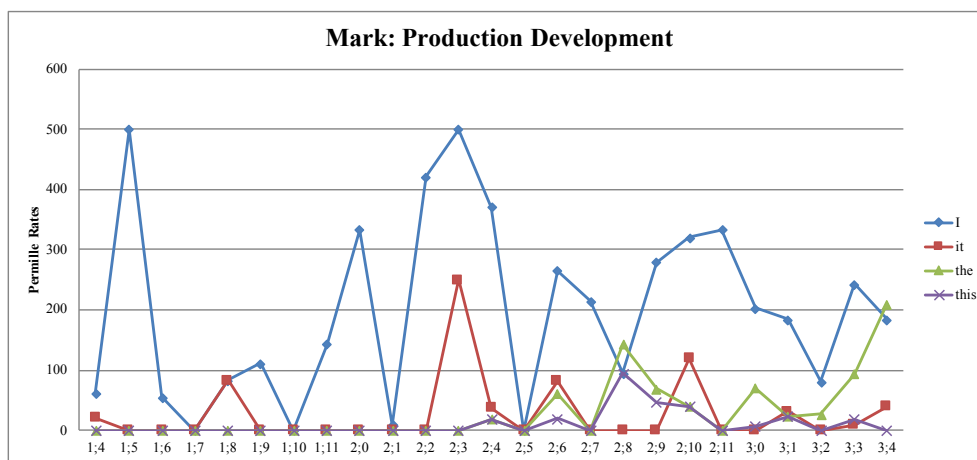
Figure A.4: Production Development: Naima Corpus

Figure A.5: Production Development: Mark Corpus

Appendix B

Appendix: Corpus Study German

List of first (of regular) uses

- Definite Article:

(202) Sebastian: da de@o [:das] Bambam [:Bonbon] rutt@o [:rot].
'The candy red.'
Context: talking about a red candy.
(2;4, sb020422)

(203) Kerstin: die Puppe auch aua@o.
'The doll hurts, too.'
Context: While playing, kerstin talks about her doll that got hurt, like herself.
(2;1, ka020101)

(204) Caroline: der ohu weint.
'The owl is crying.'
Context: Is looking at a picture book with an owl in it.
(2;0, 89-10-26)

(205) Cosima: die Tele+Tasse.
'the sippy cup.'
Context: she is asking for her sippy cup, which she calls 'Tele-Tasse'.
(2;5, cs020513)

(206) Pauline: und die Ente.
'and the duck.'
Context: playing with a puzzle and talking about what she sees on the puz-

zle.
(2;1, pa020104)

- Demonstrative Article:

(207)   Sebastian: das oder das.
        'this or that.'
        Context: Sebastian pretends to bake pancakes. He talks about what he wants
        - a pancake or apple sauce.
        (2;5, sb020519)

(208)   Kerstin: das de Wauwau.
        'this is the dog.'
        Context: looking at a picture book, she is describing what she is seeing.
        (1;6, ke010606)

(209)   Caroline: ja das.
        'Yes, that (one).'
        Context: she is doing a puzzle with her mother and points to a specific puzzle
        piece.
        (1;8, 89-06-29)

(210)   Cosima: dann das.
        'then this (one).'
        Context: Cosima is playing with a puzzle with her mother and points at a
        puzzle piece.
        (2;0, cs020026)

(211)   Pauline: auspacken das.
        'unpack this.'
        Context: refers to an object which looks like a suitcase. She wants to unpack
        it.
        (2;0, pa020005)

- Third person pronouns:

(212)   Sebastian: es ist auch totten [:trocken].
        'It is dry, too.'
        Context: he is folding fresh laundry together with his mum and refers to one
        piece of clothing.
        (2;6, sb020617)

(213) Kerstin: hat er (ge)trunken (.) Teddy.
       'He has drunk. Teddy.'
       Context: she is playing with her teddybear.
       (2;4, ke020416)

(214) Caroline: da krach es um.
       'there it crashes.'
       Context: is playing with a toy car.
       (2;4, 90-02-24)

(215) Cosima: so macht sie.
       'like so she makes.'
       Context: talks about which sounds her cat Tina makes.
       (2;4, cs020416)

(216) Pauline: da weg war es.
       'there - away it went.'
       Context: building something with Lego blocks. One Legoblock breaks from
       her construction.
       (2;2, pa020202)

- Indexical pronouns:

(217) Sebastian: bin auf Acker ich, auf Acker bin ich.
       'am on the field, I, on the field I am.'
       Context: He is standing on a potato field.
       (2;6, sb020617)

(218) Kerstin: hab ich ein.
       'have I one.'
       Context: She is catching a ball.
       (2;2, ke020221)

(219) Caroline: ich essen.
       'I (am) eating.
       Context: She is eating.
       (1;10, 89-08-29)

(220) Cosima: ich will auch.
       'I want, too.'
       Context: Like her brother, she wants to not wear pants.
       (2;2, cs020220)

(221) Pauline: ich Aua@c.
       'I (got hurt).'

Context: she is showing the investigator a cut on her leg.
(1;11, pa011106)

Feature Errors: Selection

- Gender errors:

  (222) Sebastian: *das   Eisenbahn   gucken auf der Strasse.
                     the.Neut   train.F   is looking at the street.
         'the train' should be feminine.
         (Transcript: sb020700; 2;7)

  (223) Kerstin: *Baby.   Da is(t)   die   Baby.
                   baby.   there is   the.F   baby.Neut
         'the baby' should be neuter.
         (Transcript ke010506; 1;5)

  (224) Mutter: wo is(t) denn   der   blaue luftballon?
                  where is DISC.PART   the.M   blue balloon.M

         Kerstin: *da   is(t)   sie.
                    there   is   she.F
         'she' should be 'he', in reference to the male balloon.
         (Transcript ke021027; 2;10)

  (225) Caroline: *sagt   der   Mädchen?
                    says   the.M   girl.Neut
         'the girl' should be neuter.
         (Transcript 90-02-20; 2;3)

- Case Errors:

  (226) Sebastian: *ich will nochmal   auf   (da)s   Pferd   heiten [:reiten]
                     I want again   on   the.Nom   horse.   ride
         'the horse' should be dative.
         (Transcript sb030212; 3;2)

  (227) Cosima: *ich   helf   es.
                   I   help   it.Nom
         'it' should be dative. (Transcript cs030123; 3;1)

  (228) Cosima: *nein,   gib   mich   mal   mein Taschentuch.
                   no,   give   me.Acc   PART   my tissue.
         'me' should be dative. (Transcript cs020916; 2;9)

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(229) Pauline:
*ich decke uns noch   der   kleine Löffel.
I set us PART   the.NOM   small spoon.
'the spoon' should be accusative. (Transcript pa040511; 4;5)

Complete List of AFP

In Table B.1, I excluded all accusative, dative and genetive forms. These were few and followed the nominative uses in all corpora and constructions.

	Sebastian	Kerstin	Caroline	Cosima	Pauline
Definites					
der	2;5 (sb020505)	2;6 (ke020603)	2;0 (89-10-26)	2;0 (cs020026)	2;1 (pa020115)
die	2;5 (sb020505)	2;1 (ka020101)	2;3 (90-01-12)	2;5 (cs020513)	2;1 (pa020104)
das	2;4 (sb020422)	2;4 (ka020416)	2;2 (89-12-30)	2;7 (cs020708)	2;1 (pa020115)
Demonstratives					
der	2;5 (sb020505)	2;2 (ke020221)	2;3 (90-01-09)	2;5 (cs020527)	2;1 (pa020104)
die	2;5 (sb020519)	2;5 (ke020512)	2;1 (89-11-21)	2;3 (cs020304)	2;1 (pa020115)
das	2;5 (sb020519)	1;6 (ke010606)	1;8 (89-06-29)	2;0 (cs020026)	2;0 (pa020005)
Third Person Pronouns					
er	2;7 (sb020714)	2;4 (ke020416)	2;2 (89-12-18)	2;5 (cs020513)	2;3 (pa020316)
sie	2;11 (sb021118)	2;6 (ke020602)	2;8 (90-06-15)	2;4 (cs020416)	2;4 (pa020428)
es	2;6 (sb020617)	2;10 (ke021027)	2;4 (90-02-24)	2;5 (cs020513)	2;1 (pa020202)
Indexical Pronouns					
ich	2;6 (sb020617)	2;2 (ke020221)	1;10 (89-08-29)	2;2 (cs020220)	1;11 (pa011106)
du	2;7 (sb020728)	2;2 (ke020221)	2;1 (89-11-21)	2;4 (cs020430)	2;2 (pa020202)

Table B.1: Age of First Production (AFP): German Corpora, All Constructions

Find the raw number of tokens in Table B.2. Note, however, that here, the number of the demonstrative and definite article are lumped together, as the difference between the two was only manually coded and can't be accessed through the search command for overall frequency.

Construction	Sebastian	Kerstin	Caroline	Cosima	Pauline
DEF/DEM	das: 2237	das: 632	das: 397	das: 2785	das: 2914
PRO	es: 533	er: 18	es: 90	sie: 188	es: 657
IDX	ich: 2788	ich: 509	ich: 2058	ich: 3421	ich: 3925

Table B.2: Raw Number of Tokens per Relevant Construction Overall (German Corpora)

Production Development: Graphs

Figures B.1 to B.5 give the increase in utterances per month of those constructions that are produced first within each individual corpus among the four groups: indexical, third person pronouns, definites and demonstratives. The numbers of utterances are given in permille rates, i.e. the mean number of utterances per 1000 utterances in a month (cf. Snyder (2007,[107])).
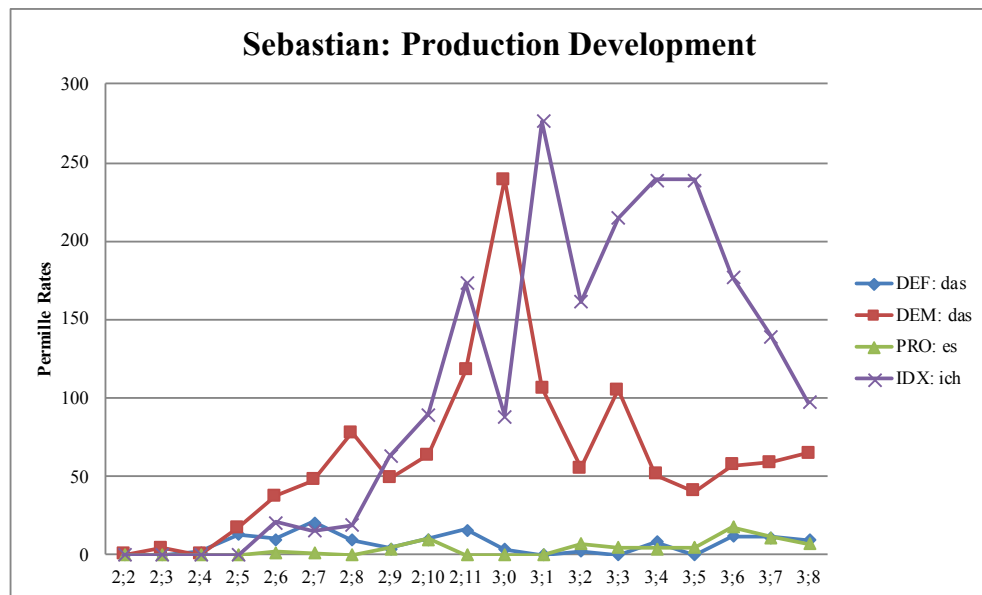

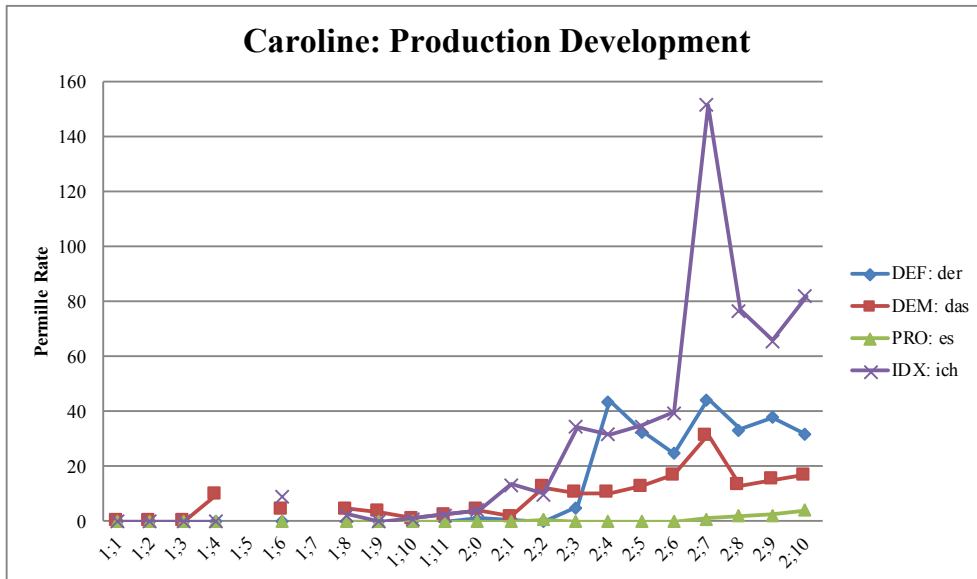Figure B.1: Production Development: Sebastian Corpus

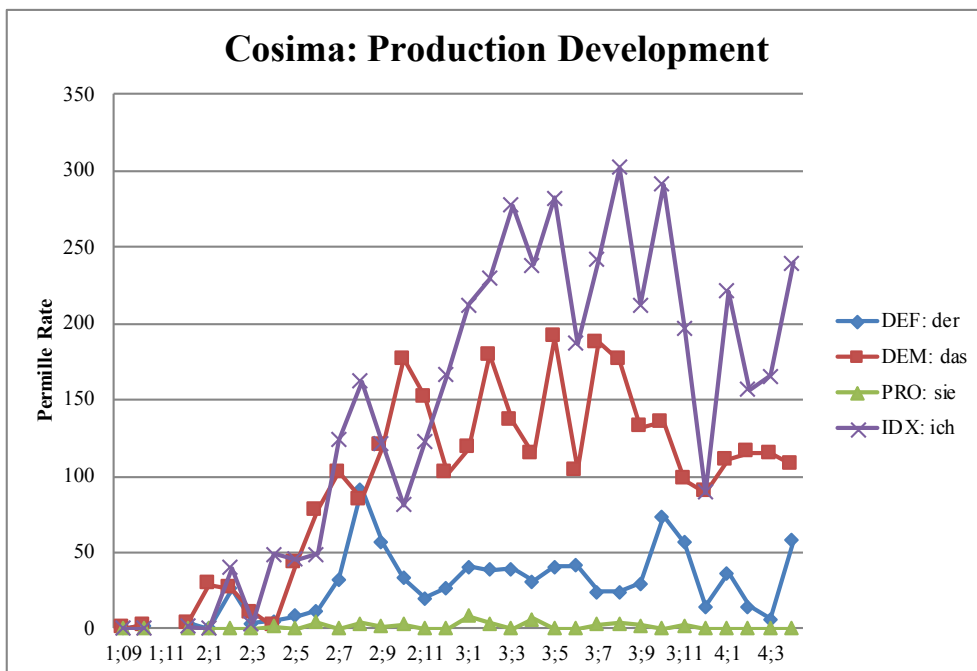Figure B.2: Production Development: Caroline Corpus

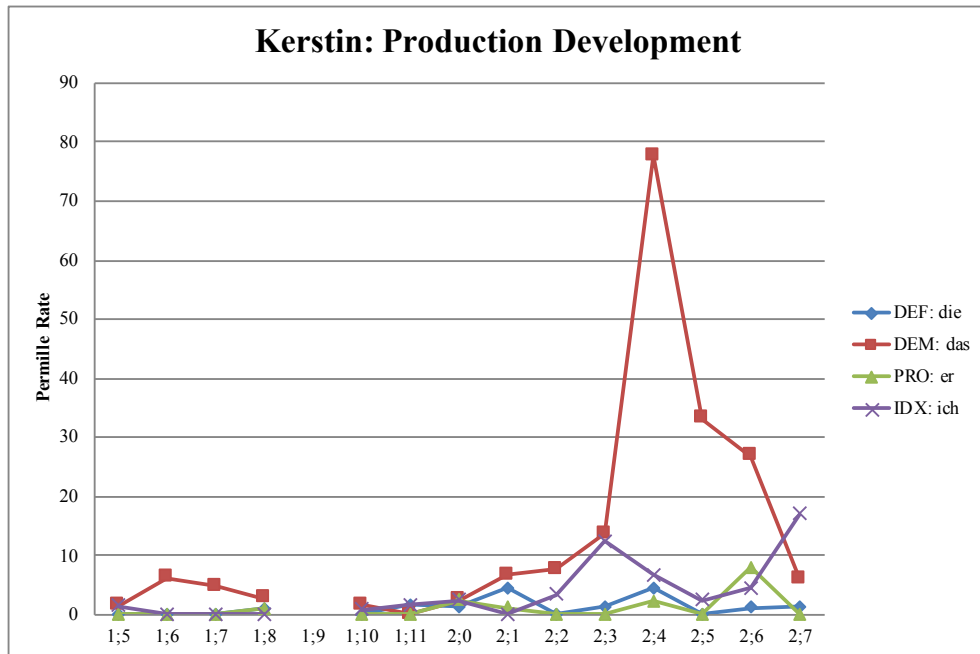Figure B.3: Production Development: Cosima Corpus

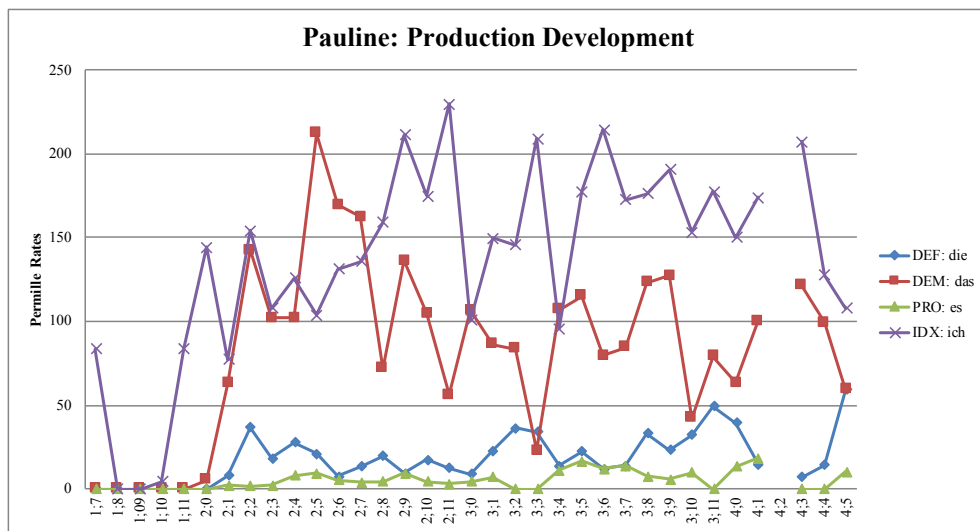Figure B.4: Production Development: Kerstin Corpus

Figure B.5: Production Development: Pauline Corpus

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Appendix C

Appendix: Experiment 'Suitcase'

Procedure

- Equipment needed: Table, Laptop with prerecorded video of Froggy, suitcase, Froggy's toys, displayed on flashcards.

- Froggy's trial sentences are prerecorded, the experimenter conducts the different context manipulations.

- Experimenter explains that they will skype with Froggy and help him pack his suitcase.

- Introductory Period:
  Exp.: So let's see where Froggy is. Ah, there he is! Hi, Froggy!
  Froggy: Hi!
  Exp.: Alright, do you want [child's name] and me to help pack some toys that we can send you?
  Froggy: Yes, that would be so nice!
  Exp: Hm, what toy does Froggy want to take with him? Froggy is allowed to take only one toy at a time.
  distributes 3 cards: two shovels and one other thing
  Exp.: Ok, let's pack a shovel!
  Froggy.: No, don't pack a shovel! Pack the train!
  experimenter animates the child to pick one flashcard and to put it in the suitcase.

- three testtrials, where experimenter distributes three known objects, Froggy names his desired toy and experimenter animates the child to pick one flashcard and to put it in the suitcase.
  testtoys: teddybear, ball, teacup

- Experiment trials always follow the same pattern: experimenter distributes three unknown objects and either 1) talks about none of the toys ('No Attention') 2) the visually unique toy ('Attention to Unique Toy') or 3) one of the two non-unique toys ('Attention to Non-Unique Toy'), then Froggy gives his cue, either using definite/indefinite article (group 1) or definite article/pronoun (group 2) and the child picks a flashcard and puts it in the suitcase (see full lists in Tables C.1 and C.2).

- control trials: Froggy does not give a clue but lets the child decide for a toy.

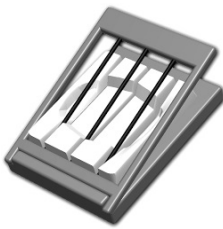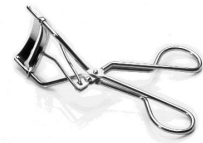- experiment closes with Froggy saying goodbye and waving.

Pictures

All test toys used:

All pictures used for Froggy's toys:

Exemplary pictures of the new material:

List of Items per Group

Context Condition	Construction	Novel Word
No Attention	Definite Article	dax
No Attention	Indefinite Article	ratch
Attention to Unique Toy	Indefinite Article	blicket
No Attention	Definite Article	spoov
No Attention	None	-
Attention to Non-Unique Toy	Indefinite Article	sprock
Attention to Unique Toy	Definite Article	plash
Attention to Non-Unique Toy	Indefinite Article	tanzer
No Attention	Definite Article	glark
Attention to Non-Unique Toy	Definite Article	tever
Attention to Unique Toy	Indefinite Article	krat
No Attention	None	-
No Attention	Indefinite Article	tife
Attention to Unique Toy	Definite Article	frap
Attention to Unique Toy	Indefinite Article	virdex
Attention to Non-Unique Toy	Definite Article	pizer
No Attention	None	-
Attention to Unique Toy	Definite Article	zav
Attention to Non-Unique Toy	Indefinite Article	gorp
Attention to Non-Unique Toy	Definite Article	chatten
No Attention	Indefinite Article	rick
Attention to Unique Toy	Definite Article	zork
No Attention	None	-
No Attention	Definite Article	stoosh
Attention to Non-Unique Toy	Indefinite Article	plimp
Attention to Unique Toy	Indefinite Article	hooler
Attention to Non-Unique Toy	Definite Article	rallot
No Attention	Indefinite Article	scook

Table C.1: List of Novel Words and Order of Conditions in Group DEF/INDEF

Context Condition	Construction	Novel Word
No Attention	Definite Article	dax
Attention to Unique Toy	Pronoun	it
Attention to Non-Unique Toy	Pronoun	it
No Attention	Definite Article	spoov
Attention to Non-Unique Toy	Pronoun	it
No Attention	None	-
Attention to Unique Toy	Definite Article	plash
Attention to Non-Unique Toy	Pronoun	it
No Attention	Definite Article	glark
Attention to Non-Unique Toy	Definite Article	tever
No Attention	None	-
Attention to Unique Toy	Pronoun	it
No Attention	Pronoun	it
Attention to Non-Unique Toy	Definite Article	frap
Attention to Unique Toy	Pronoun	it
No Attention	Definite Article	pizer
No Attention	None	-
Attention to Unique Toy	Definite Article	zav
No Attention	Pronoun	it
Attention to Non-Unique Toy	Definite Article	chatten
No Attention	Pronoun	it
Attention to Unique Toy	Definite Article	zork
No Attention	None	-
No Attention	Definite Article	stoosh
Attention to Non-Unique Toy	Pronoun	it
Attention to Unique Toy	Pronoun	it
Attention to Non-Unique Toy	Definite Article	rallot
No Attention	Pronoun	it

Table C.2: List of Novel Words and Order of Conditions in Group DEF/PRO

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