

**Dutch Children's Acquisition of  
Verbal and Adjectival Inflection**

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**DUTCH CHILDREN'S ACQUISITION  
OF VERBAL AND ADJECTIVAL  
INFLECTION**

ACADEMISCH PROEFSCHRIFT

ter verkrijging van de graad van doctor  
aan de Universiteit van Amsterdam  
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## ABBREVIATIONS

Abbreviation	Full term
1SG	1 <sup>st</sup> person singular
2SG	2 <sup>nd</sup> person singular
2SG-INV	2 <sup>nd</sup> person singular inversion
3SG	3 <sup>rd</sup> person singular
3PL	3 <sup>rd</sup> person plural
ATTR	Attributive
COM	Common
CHI	Child
DEF	Definite
EXP	Experimenter
FIN	Finite
GEN	Genitive
INDEF	Indefinite
INF	Infinitive/non-finite
LOC	Locative
NEUT	Neuter
NOM	Nominative
NON-ATTR	Non-attributive
PL	Plural
PUP	Puppet
SG	Singular
SP	Speaker



# 1

## How good are children at learning inflection?

According to some researchers, children are extremely fast and efficient inflection learners (e.g. Wexler, 1998; Hyams, 2002, 2005). Other researchers, however, view inflection learning as a gradual process, which proceeds through developmental changes and extends over an extended period of time (e.g. Pinker, 1984; Clahsen, 1990; Blom, 2003, 2008; Rus, 2007).

Wexler (1998: 43) made his position explicit by proposing that children are ‘little inflection machines’ who learn the inflectional properties of their language almost instantaneously – a phenomenon that he refers to as Very Early Knowledge of Inflection (henceforth: VEKI). However, as we will see in this chapter, the available data do not provide unequivocal support for Wexler’s claim. It will be shown that the studies’ contradictory results are, to some extent, due to the fact that the studies differ from one another in the methodologies used for data collection as well as in data analyses techniques. The conclusion of this chapter will be that, given the insufficient empirical support from the available data, new evidence is necessary to assess the claim that children have very early knowledge of inflection. Moreover, an overview of relevant literature suggests that VEKI may need to be complemented by a hypothesis that emphasizes the role of salience in the linguistic input.

The chapter is organized as follows: More background on VEKI is given in Section 1.1. In Section 1.2, four issues are discussed that may cast doubt upon VEKI. Section 1.3 presents the aims of the thesis, and finally, Section 1.4 offers a detailed, chapter-by-chapter outline of the thesis.

### 1.1 Children as little inflection machines

Wexler (1998) claims that children have knowledge of inflection at the earliest observable stage of language production. This phenomenon is regarded as

‘Very Early Knowledge of Inflection’ and captured under the VEKI hypothesis stated in (1).

- (1) *At the earliest observable stage (from the time that the child enters the two-word stage around 18 months of age) the child knows the grammatical and phonological properties of many important inflectional elements in their language.*  
(cited from Wexler, 1998: 25)

Wexler’s basic idea (e.g. Wexler 1990, 1994, 1998, 1999) goes contrary to the assumption of, what he calls, the ‘standard view of grammatical development’ (Wexler, 1998: 24). The standard view of grammatical development assumes that those aspects of grammar which depend on experience, develop slowly, while that those aspects of grammar which are innate are present very early. In contrast, Wexler argues that some innate aspects of grammar emerge late, whereas grammatical aspects that must be learned are in place very early. This means that some grammatical development is determined by maturation, and unfolds over time. Grammatical development of this sort is argued to be programmed according to a genetic blueprint that is the same for all children across all languages. Language learning that is dependent on experience may take place very early on in development (according to VEKI, before 18 months). This implies that children develop language with minimal experience and little environmental influence. To support his claim, Wexler addresses root infinitives, which are infinitival verbs that appear in finite matrix clauses, where target grammar requires a tense- and/or agreement marked verb. According to Wexler’s argumentation, children’s non-adult-like grammatical productions (i.e. root infinitives) are not simply the result of a learning process but, instead, are linked to “a genetic program that determines the structure and timing of grammar in the human mind/brain” (Wexler, 1999: 61).

Inflection, under the standard view, is thought to be an experience-dependent property. Further, it is claimed that inflection appears late in development, and that learners’ incorrect grammatical usage can be attributed to the fact that there is much to be ‘learned’ (e.g. Pinker, 1984; Clahsen, 1990; Blom, 2003, 2008; Rus, 2007, Blom and Wijnen, submitted). More specifically, under the standard view, acquisition of inflection does not occur as an abrupt change, i.e. there is no immediate switch from non-adult to adult grammar. Instead, under this view, acquisition of inflection is viewed as a learning process that spreads over a longer period of time.

Contrary to the standard view, Wexler argues that very young children already know a lot about verbal inflection. For example, Poeppel and Wexler (1993) analyzed the spontaneous speech of a 25-month-old German-speaking boy: Andreas, and found that: (i) 1<sup>st</sup> and 3<sup>rd</sup> person singular subjects always co-occurred with the correct verbal agreement; (ii) 2<sup>nd</sup> person singular subjects were rare and; (iii) all agreement errors (in total, seven out of 231 possible utterances) occurred with plural subjects. In addition to Andreas' data, Poeppel and Wexler also discussed evidence from the data of Clahsen (1986), and concluded that, when young German children (aged 2;1 – 3;6) produced verbal inflection, they usually also chose an appropriate subject which agreed with it.

Harris and Wexler (1996) showed a similar process in English, whereby children do not err with regard to subject-verb agreement relation: If a subject has certain morphosyntactic features, then children's verbal inflection will be in agreement with these features. Harris and Wexler documented children's accuracy with verb inflection on all first person singular nominative pronominal subjects. They analyzed transcripts of ten children (age range: 1;6 – 4;1) and found that the children very rarely used 3<sup>rd</sup> person singular verbal forms with first person singular subjects (three cases out of more than 1,700 sentences). That is, children did not say sentences such as: *I likes ice cream*. The same pattern held for the possessive *have*, i.e. *has*. Errors such as *I has no shoes* were not attested in the corpora with 1<sup>st</sup> person singular subjects.

There are also studies which investigate this phenomenon in languages that are assumed to be more inflectionally rich than those mentioned above, for example, Spanish, Italian, and Catalan. These studies (summarized in Table 1.1) report agreement errors under 5%; a finding that is in line with those reported in Wexler (1998).

**Table 1.1: Overview of child's data with low agreement error-rate in Romance languages**

Language	Child	Age	N of utterances	Error rate	Source
Catalan	Gisela	1;10-2;6	81	1,20%	Torrens (1995) in Montrul (2004)
Catalan/Spanish	Josep	1;9 -2;6	136	3 %	Torrens (1995) in Montrul (2004)
Catalan/Spanish	Marti	1;9 -2;5	178	0,56%	Torrens (1995) in Montrul (2004)
Italian	Diana	1;10-2;6	610	1,50%	Guasti (1994) in Hyams (2005)
Italian	Claudia	1;4 -2;4	1410	3 %	Pizzuto and Caselli (1992) in Deen (2002)

Based on early speech production data, Wexler (1998: 43) concluded that it is very hard to find examples of “central inflectional material” that would cause difficulty for young children. According to Wexler (1998: 42), “there may be *some* inflectional properties that are not known at the earliest stages, since these *must* be learned. But in general, the morphemes of verbal agreement *do* seem to be known, in the sense that their phonology is in general known *and* their grammatical features are known”. This suggests, for example, that English-speaking children know that the phoneme  $-s$  is specified as [3<sup>rd</sup> PERSON; SINGULAR; PRESENT].

Based on this explanation, however, one might wonder why English-speaking children still produce utterances like *Daddy like coffee* (example taken from Bloom, 1970). If agreement morphemes were acquired so early, the expectation would be that the  $-s$  affix, which marks the 3<sup>rd</sup> person singular, has already been learned. Wexler contends that these errors in English can be explained on the basis of the distinction between finite and non-finite forms. He argues that children go through an Optional Infinitive stage, where children use non-finite forms interchangeably with finite forms. During this stage, however, children do in fact know the properties of both finite and non-finite



clauses. Things such as word order, and the placement of negation, for example are accurate and in tact. The notion ‘Optional Infinitive stage’ refers to a cross-linguistic developmental stage in which children between approximately 1;5 and 3;0, opt for an infinitival verb in a matrix clause, where the adult grammar would require a finite form. The example in (2) shows some examples from early child Dutch, French, Russian and English (examples taken from Haegeman, 1995; Pierce, 1989; Brun, Avrutin and Babyonyshev, 1999 and Brown, 1973, respectively).

- (2) a. *gras eten*  
 grass eat-INF
- b. *Michelle dormir*  
 Michelle sleep-INF
- c. *mama spat'*  
 mummy sleep-INF
- d. *he tickle a feet*  
 he tickle-INF a feet

Instead of arguing that children drop the 3<sup>rd</sup> person singular inflection, as one might assume (e.g. Brown, 1973), Wexler claims that children are producing genuine infinitives (Schütze and Wexler, 1996; Schütze, 1997 but see Blom, 2007).

The empirical evidence summarized in this section suggests that young children are virtually errorless when it comes to producing (verbal) agreement inflection. This observation led Wexler to the conclusion that children are ‘little inflection machines’ as they seem to have knowledge of the grammatical and phonological properties of inflection from the very onset of their language production (Wexler, 1998: 43).

## 1.2 Some doubts about Very Early Knowledge of Inflection

Wexler (1998: 43) makes a strong claim that children are ‘little inflection machines’. After all, children do seem to know a good deal of inflection before they even enter the two-word stage. Wexler also recognizes that “there is no reason to think that all inflectional material is known by the time that children are producing language (at the age of one year on average)” (1998: 42) and that “so many inflections remain to be investigated, and there could be all sorts of reasons that really do make certain inflections difficult to master” (1998: 43). Basically, by calling children ‘little inflection machines,’ Wexler is emphasizing the fact that children need very little time to master inflection.

However, as pointed out by Wexler himself, the available evidence is not sufficient to conclude, inconclusively, in favor of his claim. Nearly all the available data come from studies on children’s spontaneous speech production. Strictly speaking, it cannot be proved, on the basis of production data alone, that children know inflection before they enter the two-word stage. At this age, children’s one-word utterances simply do not provide reliable evidence for morphosyntactic agreement. According to Wexler, in order to either support or reject VEKI, it is necessary to conduct cross-linguistic tests with young infants, which take advantage of new experimental techniques such as the Headturn Preferential Procedure (Kemler Nelson, Jusczyk, Mandel, Myers, Turk and Gerken, 1995; Jusczyk, 1998). Furthermore, there also exists empirical evidence which seems to contradict VEKI. I will turn to some of these findings in the following.

Although VEKI is a very interesting and challenging hypothesis, there are some empirical issues that may cast doubt on the claim that children know the grammatical and phonological properties of agreement inflection at a very early age. In this section, I will pay attention to four main issues and discuss why they lead to doubts with regard to VEKI. First, the empirical support for VEKI allows for two possible interpretations: The high accuracy percentages in two-year-olds could mean that children possess early knowledge of agreement inflection. Alternatively, it could mean that children memorize separate inflectional forms in the lexicon. Second, new data-driven research provides evidence that, depending on the type of data-analysis, the amount of agreement errors can rise up to 50%. Third, cross-linguistic studies demonstrate variation in the developmental speed of inflection acquisition (e.g. paradigmatic contrasts in verbal paradigm in Turkish emerge earlier than in English). The fourth and

final issue that casts doubt on VEKI has to do with the variation in the speed of development between inflectional domains (verbal vs. nominal). It will soon become clear that the third and fourth issues just mentioned (variation across languages and across domains) pose the same problem for VEKI, namely that some inflections appear considerably earlier than other inflections; sometimes up to two years earlier. In the following I will focus on each of these four issues in turn in more detail.

*(1) The empirical support for VEKI is ambiguous.*

In evaluating the empirical support for VEKI, I would like to argue that the data used by Poeppel and Wexler (1993) and by Harris and Wexler (1996), as reported in Wexler (1998), are not rich enough to support VEKI. The main pitfall of these studies is that, nearly all of the conclusions are based on collections of spontaneous speech. Although spontaneous speech data enables researchers to accurately document children's emerging inflectional forms, it does not allow researchers to determine the degree to which a child's speech is productive.

There are three major limitations in using spontaneous speech when exploring inflection development. First, spontaneous speech data are likely to contain little paradigmatic variation. That is, the distribution of paradigmatic forms is dependent on the child's individual preference and on the topics that a child chooses to discuss. This may make it impossible to determine why a particular morpheme is absent from spontaneous speech. Research shows that children tend to produce verbal inflection for 1<sup>st</sup> and 3<sup>rd</sup> person singular, and that they rarely produce verbs in the 3<sup>rd</sup> person plural (see, for example, Poeppel and Wexler, 1993; Wijnen and Verrips, 1998; Blom and Wijnen, submitted). This observation could provide evidence for: (i) the absence of an inflectional morpheme due to a lack of linguistic ability; (ii) the absence of an inflectional morpheme due to a lack of exposure; or (iii) for the absence of an inflectional morpheme due to a lack of appropriate discourse contexts in the sample.

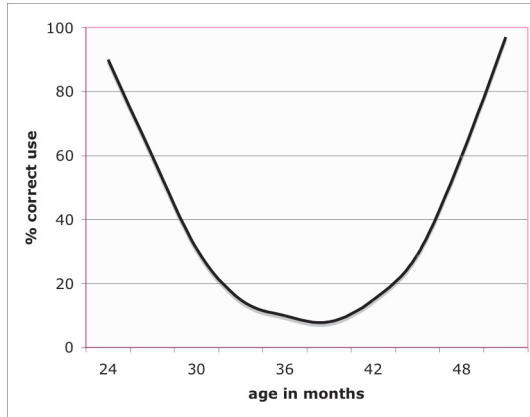
Second, there is little variation in children's lexical production in the early developmental stages. That is, children tend to use only a few different verb types. This is especially true when one considers the actual size of available corpora upon which, a majority of the research is based. Blom and Wijnen (submitted) analyzed the early utterances of six Dutch children aged 1;7 – 3;4.

Here, they showed that children in the initial stages (average MLU = 1.125) only used between two and nine different verbs (types) with finite inflection. This finding can be interpreted in two ways. First, it could indicate that children have inflectional knowledge and attach an inflectional morpheme to a verb stem (e.g. *loop* + *t* ‘walk + s’). Even if this were the case, the productivity of inflections cannot be assessed because the children’s productive lexicons at this age are so small. The alternative interpretation is that children’s early inflections are rote-learned and that children use them repeatedly without any morphological analysis (e.g. *loopt* ‘walks’).

Third, the most convincing evidence that children use inflections productively come from data showing that children say something that they could not possibly memorize from the input (Berko, 1958; Pinker, 1999). Productivity is an indication that a child is making use of inflectional rules. Some indications of productivity in spontaneous speech include children’s use of inflection with self-invented words, and substitution errors. In general, children’s active vocabulary at two years is not very rich (according to Aitchison (1994) about 500 words). It is therefore, not very likely that researchers will find self-invented words in the corpora of two-year-olds.

Given these three limitations, we can conclude that spontaneous speech samples are not adequate to assess the productivity of children’s inflectional knowledge. Consequently, they are also inadequate to empirically test VEKI. The data obtained from spontaneous speech of two-year-olds are simply too ambiguous, which leads to a general disagreement about children’s knowledge of inflection at this stage: Some researchers interpret the information provided by spontaneous data as evidence that two-year-old children are extremely good inflection learners. Others, however, argue that children’s early inflections are rote-learned and appear only in a very limited number of contexts (schemas) (Goldberg, 2003; Tomasello, 2003) or as word specific paradigms (Pinker, 1984).

In order to assess to what extent developmental changes play a role in children’s acquisition of inflection, one must monitor children’s development over time. One well-known phenomenon concerning developmental changes is the *U-shaped curve*, which characterizes children’s development of past tense morphology in English (e.g. Marcus, Pinker, Ullman, Hollander, Rosen and Xu, 1992; Pinker, 1999). As illustrated in Figure 1.1, a U-shaped curve describes a course of development that begins with good performance, is followed by a decrease in success, and then finally, good performance once again.



**Figure 1.1: A fictive example of a U-shaped developmental curve.**

A U-shaped curve predicts that errors are absent in early stages. Since Poeppel and Wexler (1993) did not analyze Andreas' data longitudinally, and since they only focused on a single developmental point (age 2;1), it is not surprising that their analysis revealed very few errors. Their results, for example, could simply represent the initial stage of the U-shaped developmental curve. Thus, without considering children's development over time, it was not possible to gain a full understanding of the child's inflectional development.

While Poeppel and Wexler's data do not speak explicitly against the claim that children have very early knowledge of inflection, their data are incomplete since the authors do not consider the entire course of development in their analysis. The extremely high percentage of correct inflections at this age was not necessarily an accurate portrayal of the children's developmental curve. Further, the lack of errors at this single stage allows for different interpretations: The errorless performance could also indicate, for example that children's early inflections are simply memorized in the lexicon. In sum, the high rate of accuracy found in the spontaneous data of two-year-old children does not provide unequivocal support for Wexler's claim.

*(II) Other empirical studies report higher error-rates.*

Recent findings from child Dutch, Spanish and Italian, indicate that children's performance was not as flawless as VEKI predicts. These studies broke down children's production data by looking at their performance with specific paradigmatic cells. In addition, some of the studies also analyzed children's performance over time. Overall, these studies demonstrated that children made considerably more errors than the rates reported in Table 1.1. In the following, I will expand on the nature of these studies in more detail.

De Haan (1996) documented the inflection development of four Dutch children from 1;8 to 3;4, whose data was taken from the Groningen corpus (Bol, 1996), which is available from CHILDES web database (MacWhinney, 2000). De Haan demonstrated that all four children followed the same developmental sequence, and that this sequence was in line with the first two stages of the U-shaped curve as mentioned previously. Specifically, the errorless stage was followed by an increase of inflection errors. Although data was not available for these children beyond 3;4, we can assume that the children eventually ridded their speech of inflection errors, thus completing the U-shaped curve. In the longitudinal data, De Haan focused on errors that Dutch children made with verbal inflection in the present tense. She distinguished between person and number agreement and observed that, in the initial stages, children did not make any errors in either domain. At 2;5, however, number agreement errors began to appear, and just one month later (2;6), errors with person agreement were also present. At the children's worst performance, De Haan reported that the overall error-rate reached 29%.

In an analysis of the verbal paradigm in two Spanish-speaking children (Juan, age: 1;10 – 2;5 and Lucía, age: 2;2 – 2;7), Aguado-Orea (2004) and Aguado-Orea and Pine (2005) demonstrated that, when inflectional contexts were collapsed altogether, the overall error rates in child Spanish appeared to be extremely low (4.4% and 4.5%). However, when the inflectional contexts were analyzed separately, the error rates in 3<sup>rd</sup> person plural present tense reached higher than 50%. According to Aguado-Orea and Pine, the overall percentage of accuracy was inflated because of children's high accuracy rates in the 3<sup>rd</sup> person singular. When the inflectional contexts were analyzed separately, the error rates increased dramatically. Thus, whereas 2<sup>nd</sup> singular forms in Juan's sample showed a 10.2% error rate, Lucía's error rate raised to almost 23%. This was even higher in the case of 3<sup>rd</sup> person plural, where Lucía performed worse than chance. When 3<sup>rd</sup> person singular was discarded from the count, the

overall error rate raised to 15.2% for Juan and 27.5% for Lucía. Moreover, roughly 75% of all verbs produced in the samples were highly frequent verbs. In the samples of both children, the same distributions were found with respect to both verb types and verb tokens. The most frequent verbs produced in the samples were: *querer* ‘to want’, followed by *tener* ‘to have’, *poder* ‘can’, and *poner* ‘to put’. Aguado-Orea and Pine also showed that the error rate also increased when the most frequent verb tokens were excluded from the analysis.

Differences in accuracy across inflectional contexts were also reported in a cross-sectional investigation of children’s verb inflection in Italian (Leonard, Caselli and Devescovi, 2002). The study used elicitation tasks in order to explore the use of verbal inflections by children from 2;5 to 7;1. Leonard et al. reported that children in all age groups were equally accurate in using 3<sup>rd</sup> person singular. In this condition, all groups reached an accuracy level of 97.5% or higher. Significantly lower accuracy levels were found in the two-year-old group (age range: 2;5 – 3;1) for 1<sup>st</sup> person plural, 3<sup>rd</sup> person plural and the 1<sup>st</sup> person singular. The older children (3;1 – 7;1 years) reached above 90% accuracy in all conditions (Brown, 1973). Interestingly, the outcome of the error-analysis showed that children’s errors most often differed from the target construction by a single feature of either number or person. The substitutions appeared in the following directions (i) 3<sup>rd</sup> person singular replaced the 1<sup>st</sup> person singular (ii) 1<sup>st</sup> person singular replaced the 1<sup>st</sup> person plural and (iii) 3<sup>rd</sup> person singular replaced the 3<sup>rd</sup> person plural.

In sum, the data from child Dutch, Spanish and Italian reveal that children’s output can change over time and that error rates can vary considerably across inflectional contexts. Moreover, factors such as frequency may also play a role. Given the higher error-rates reported in these studies, one could easily conclude that children are less perfect inflection learners than VEKI would predict. However, to draw such a conclusion, more information about the data is necessary. For example, it might be the case that different patterns emerge, depending on how researchers collapse different types of verbs (lexical, modals, auxiliaries etc.), or verbs from different conjugation classes. This issue is important because it might have significant consequences for the interpretation of the findings. That is, children may have knowledge of agreement but might still misclassify inflectional paradigms. Subsequently, misclassification of a paradigm may cause higher error-rates in children’s output. I will return to this issue in Chapter 7.

*(III) There is variation across languages.*

Cross-linguistic studies report that children correctly produce inflections before the age of two if the inflections are regular and salient. The development of inflection is slowed down when inflections have an opaque character (e.g. Slobin, 1985; Peters, 1985; Dressler, 1997; Bittner, Dressler and Kilani-Schoch, 2003; Voeikova and Dressler, 2002; Laaha and Gillis, 2007).

Bittner et al. (2003) provided a collection of detailed longitudinal analyses of children's production of verbal inflection in fourteen different languages. The data samples were based on naturalistic, production data, beginning at the child's speech onset (age range: 1;3 – 2;0) and lasting until the age of about two and half years (range: 1;10 – 3;8). The research focused on the emergence of verbal mini-paradigms, which are, from an adult's perspective, incomplete paradigms. Based on this view, mini-paradigms represent inflectional productivity, and are found whenever three phonologically unambiguous and distinct inflectional forms of the same lemma have emerged and recurred in spontaneous production in various contexts in the same month of recording (Kilani-Schoch and Dressler, 2002; Bittner et al., 2003). In other words, in order to be considered a mini-paradigm, a child has to produce inflections in paradigmatic and lexical variation during a short period of time.

According to this criterion, Bittner et al. report that, from the onset of speech production, it takes only two to four months for children acquiring Turkish, Finnish, Russian and Croatian, to produce their first verbal mini-paradigms. The same process takes children acquiring Yucatec Mayan, Italian, French, Dutch, German and English at least twice as long. For the sake of comparison, mini-paradigms appear at 1;7 in Turkish (Aksu-Koç and Ketrez, 2003) and at 2;5 in English (De Villiers and De Villiers, 1985; Gülzow, 2003). The order of inflection development across languages presented by Bittner et al. seems to reflect properties of the inflection systems: Turkish children have little difficulty with inflection because of the morphophonological regularities, whereas English children lag behind due to the opacity of the English verbal paradigm. It should be noted, however, that conclusions made in Bittner et al. are based on investigations of a relatively small number of children. More specifically, ten out of fourteen languages in this sample were case studies. And while these studies do indeed show valuable developmental tendencies, they lack the power to draw generalizations.



*(IV) There is variation across inflectional domains.*

In addition to cross-linguistic variation in acquisition of inflection, there are also studies that report on variation across inflectional domains. Given that VEKI is not limited to the verbal domain, developmental asymmetries across domains (e.g. between verbal and nominal domain) are not to be expected. However, in an experimental investigation of verbal and nominal inflections by Hungarian children between 2;10 and 4;7, Gábor and Lukács (2006) demonstrated that noun inflections (i.e. cases) were productive in all age groups whereas verb inflections (i.e. person and number agreement) were much slower to develop, reached ceiling level at 4;7. Gábor and Lukács tested children's inflectional knowledge by employing nonce nouns and nonce verbs and eliciting their production. Their experiments revealed a striking difference between children's success rate with nouns and verbs. In fact, the authors reported a difference of nearly two years. Interestingly, verbal and nominal inflection in Hungarian have different typological characteristics: Nominal inflection is typically agglutinating whereas verbal inflection has more fusional properties. This pattern within the language is analogous to a cross-linguistic difference, between Turkish and Italian. Recall from above that Turkish children are faster than Italian children at building inflectional paradigms. It is thus possible that the agglutinating structure affords for easier learning, and that this tendency holds both within a single language, and across languages.

A similar developmental asymmetry is reported by Pheiler (2002) for children learning Yucatec Mayan. Pheiler demonstrates that verb inflection with agglutinating properties appears around age two, whereas in nominal inflection, which is predominantly fusional in nature, no case markers were attested until the end of the analyzed periods at 2;3 and 2;4.

However, the developmental variation across domains does not concern only the fusional/agglutinating opposition. Developmental variation between nominal and verbal inflection has also been reported within highly fusional languages. For example, Slobin's (1985) comparison of verbal and nominal inflection in Slavic languages (Polish, Russian and Servo-Croatian) revealed that the inflection in the nominal domain lagged behind those in the verbal domain. In contrast, based on cross-linguistic investigations of fusional languages collected in Bittner et al. (2003) and in Voeikova and Dressler (2002), Dressler, Stephany, Aksu-Koç and Gillis (2007) concluded that noun morphology is

acquired faster than the verb morphology. How might one explain this contradiction?

Crucially, Dressler et al.'s (2007) comparison between verbal and nominal inflection did not make a distinction between agreement inflection that is dictated by the syntax, and inherent inflection, which is syntax-independent (see Booij (2002) for a detailed description). In other words, Dressler et al.'s conclusion was based on an analysis where all morphemes that were encountered in children's spontaneous speech were collapsed (i.e. morphemes encoding inherent inflection, agreement inflection, derivational morphemes and compounds). As a consequence, the data did not provide information solely about acquisition of agreement inflection, but rather about the acquisition of morphology in general. When the focus is only on agreement inflection, we observe differences in verbs and nouns. In particular, the authors found that, by the end of the study, children produced very few paradigmatic contrasts with nominal inflection (age range: 1;3 - 4;8) (data collected in Voeikova and Dressler, 2002). With verbal inflection, however, (data collected in Bittner et al., 2003) all children made at least two paradigmatic contrasts by the end of the study (age range: 1;10 - 3;8). Based on this more refined comparison, and on the findings reported by Slobin, I can conclude that, in fusional languages, verbal inflection develops earlier than nominal inflection.

### **1.3 Aims of the thesis**

VEKI's claim that children are 'little inflection machines' undoubtedly challenges the prevailing view and raises an interesting debate with respect to acquisition of inflection. The discussion of relevant literature showed that the available data from early developmental stages might not be sufficient in order to assess VEKI in a reliable way. It has been observed that the rates of accuracy in inflection differ across paradigmatic contexts and that acquisition of inflectional morphemes varies across languages as well as across domains. Obviously, Wexler is aware of these differences and leaves some space for variation. He states "inflectional properties interacting with the innately unfolding aspects of inflection create quite different surface effects in the development of different languages" (Wexler, 1998: 26). Wexler, however, does not address this issue in detail. Similarly, with respect to VEKI, he does not specify what 'the many important inflectional elements are, nor does he make explicit, what specific grammatical and phonological properties children at 18 months are expected to know. VEKI does not make specific predictions about

which inflectional morphemes are acquired earlier than others, nor does it state whether or not there is a default within an inflectional paradigm. In this respect, testability of VEKI is very limited. To empirically assess VEKI, I interpreted it as an empirical generalization, which states that children have full knowledge of agreement inflection at the age of 18 months. Note that my formulation of VEKI is slightly different from the original formulation cited in (1), as it is stronger. This reformulation is necessary in order to make the generalization expressed by VEKI falsifiable.

With regard to the process of acquisition itself, VEKI represents a maturational account in which children's failure to produce correct inflectional forms is often ascribed to immature representations. Although nobody in child language research would deny the fact that language acquisition depends on both biology and experience, the extent to which both processes are involved remains debatable. In the case of inflection, it could be that some morphemes are acquired later than others, simply because they are unsalient and hence, not easily accessible to the language-learning child. If one wants to accurately portray the process through which children acquire inflection, it is crucial that one complements an internal account, that is, one which focuses on maturation as driving inflection, with an external account, which focuses on the role of salience in the linguistic input.

In theory, there are two ways to approach the issue of maturation vs. salience in children's inflection development. The first approach would be to pinpoint how the internal mechanisms drive inflection development. The second approach would be to investigate how salience contributes to changes in the developmental process. In the present study I choose to approach the acquisition of inflection by exploring the role of the salience. Thus, although I acknowledge that children are genetically equipped to learn a language, I do not make the a priori assumption that the changes that occur reflect a general maturational pattern. Instead, I focus on the nature of the salience, and its impact on inflection development.

This study explores the acquisition of inflection by monolingual Dutch children. It can be viewed as a follow-up of several investigations of the early acquisition of verbal morphosyntax (e.g. Schlichting, 1996; Wijnen and Verrips, 1998; Blom, 2003, 2008). These studies, however, focus primarily on the acquisition of verbal inflection, thus, data regarding the development of inflection in other areas is lacking. Further, the available studies focus primarily on children's spontaneous speech data. These studies would surely be

complemented by experimental data. The current study aims at filling in these gaps by conducting experiments which investigate children's acquisition of verbal and adjectival inflection, and compare the two developmental trajectories with one another.

The aim of the present investigation is twofold. First, based on new experimental data from child Dutch, the study attempts to verify the claim that children have very early knowledge of inflection. Second, the study investigates whether Dutch children's developmental patterns with inflection can be accounted for in terms of salience.

In order to assess whether Dutch children know inflection from an early age, this study examines the inflectional productivity in monolingual Dutch children between the ages of three and eight and the perceptive sensitivity to inflectional patterns in Dutch infants aged 18 and 19 months. In order to overcome limitations of spontaneous speech data, the knowledge of verbal and adjectival inflection was tested by means of elicited production tasks. In verbal inflection, children were tested with nonce verbs in order to control for productive use of inflection rules. In adjectival inflection, which constitutes a rather complex agreement system, the productivity of rules was measured by controlling for grammatical gender assignment. I did not perform the elicited production tasks with children younger than three years. This decision was based on three factors: First, it is difficult to maintain the same experimental control in elicitation tasks with children younger than three (see also Thornton, 1996 for detailed discussion about using elicited production tasks). Second, there are indications that Dutch children start using finite forms with lexical verbs around the age of three (Blom, 2003). Until that stage, Dutch children show a strong preference for using infinitives or an inflected auxiliary verb in combination with an infinitive (e.g. Blom, 2003). Third, there are indications that Dutch children start using *determiner-adjective-noun* combinations (which is a prerequisite for testing production of the adjectival inflection) around three years (Rozendaal, 2008). In order to assess the empirical generalization based on VEKI, it was also necessary to learn about the inflection development of younger learners of Dutch. As an alternative to elicited production (which is not possible at young ages), I investigated children's early sensitivity to finite inflection in a perception experiment, using a Headturn Preference Paradigm (Kemler Nelson et al., 1995). This experiment produced reliable, experimentally controlled results about 18- and 19-month-old infants' perception of correct and incorrect inflection.

## 1.4 Outline of the thesis

In Chapter 2, I expand on the nature of salience. I discuss five salience factors and their influence on the order in which children learn inflectional morphemes. I will argue that salience of any given morpheme is not based on one single factor alone, but instead, on a variety of factors.

Chapter 3 provides a description of the Dutch verbal and adjectival inflection systems and introduces a procedure that is used to assess the level of salience within and across inflectional paradigms. After assessing the salience of the individual inflections, I assess the overall level of salience by accumulating all factors. Based on the level of salience, I formulate a number of specific predictions for the acquisition of verbal and adjectival inflection in Dutch. The remainder of Chapter 3 provides a detailed discussion of the existing empirical observations and relates them to the predictions. Towards the end of Chapter 3, research questions are presented.

Chapters 4 through 6 report on my empirical investigation, where I address the research questions that were formulated in Chapter 3. Chapter 4 examines the acquisition of finite verb inflection in children between three and six years by analyzing elicited production with existing and nonce verbs in various inflectional contexts. Chapter 5 investigates sensitivity of finite inflection in 18- and 19-month olds by means of Headturn Preference Paradigm. The focus of the perception experiment is on whether infants can detect agreement violations in 3<sup>rd</sup> person singular and 3<sup>rd</sup> person plural contexts. Chapter 6 investigates the acquisition of attributive adjectival inflection in children between three and eight years by using elicitation tasks.

The final chapter provides a summary of the main conclusions from the preceding chapters and presents a section with suggestions for future research.



# 2

## The role of salience

One well-known observation in cross-linguistic studies on child language is that Turkish inflection emerges early (e.g. Slobin, 1985; Bittner et al., 2003). The example in (1) demonstrates that, in Turkish, each morphosyntactic feature is encoded in a separate affix and added to a root (or root-affix combination). This results in affixes that have a one-to-one form-feature relation. With a noun like *ev* ‘house’, each of the features, LOCATIVE and PLURAL, are added to the noun base as separate affixes in a fixed linear order. The affixes are regular (with almost no exceptions to the rules) and clearly segmentable.

(1)	a.	<i>ev</i>		‘house’
	b.	<i>ev-de</i>	LOCATIVE	‘in the house’
	c.	<i>ev-ler</i>	PLURAL	‘houses’
	d.	<i>ev-ler-de</i>	PLURAL, LOCATIVE	‘in the houses’

The characteristics of Turkish inflection described above (easy segmentation of affixes, a fixed position relative to a stem and one-to-one correspondence between affixes and features) are characteristic for agglutinating languages in general. Further, these characteristics are often cited to explain why children master such inflectional systems early (Aksu-Koç and Slobin, 1985; Peters, 1997; Aksu-Koç and Ketrez, 2003). Likewise, inflection development in languages which lack these properties is expected to be slower.

Slobin (1973, 1982, 1985) was the first to argue that the order in which children acquire inflectional morphemes (and grammar in general) is guided by specific properties of linguistic structure. Based on observations of language development from a large number of typologically different languages, Slobin extracted a number of strategies, which he called ‘operating principles’. Operating principles describe how learners analyze language input and how

learners discover grammatical structure. Among the most important operating principles are (i) ‘pay attention to the order of the words’, (ii) ‘avoid exceptions’ and (iii) ‘pay attention to the end of the words’. In addition, Slobin proposed that, as children acquire the inflectional morphology of their language, they rely on salience factors such as frequency and on conceptual and phonological salience. As a consequence inflectional morphemes which are salient, are perceived and produced early. Similarly, Peters (1997) argued that inflectional morphemes are easy to acquire when they are frequent, easy to segment, have a fixed position relative to the stem and a clear-cut form-feature correspondence.

There are, however, also some properties of inflectional morphemes that deem them less salient, and consequently, tend to emerge later in development. All of the following properties are of this type: Morphemes that encode multiple features; morphemes that are unstressed and/or non-syllabic, and inflectional morphemes which are embedded within words (i.e. infixes). In support of the proposals put forth by Slobin and Peters, empirical studies show that morphemes with salient properties pose little difficulty for children whereas opaque morphemes are acquired later in development (e.g. Brown, 1973; Slobin, 1985; Voeikova and Dressler, 2002; Bittner et al., 2003).

In Chapter 1, I proposed that if I want to account for the observation that certain morphemes are acquired early while others are acquired late, then it is necessary to consider the role of salience. The present chapter discusses the role of five factors that are reported in the literature to contribute to the salience of inflectional morphemes: Phonological salience (2.1), positional salience (2.2), feature salience (2.3), feature complexity (2.4), and input frequency (2.5). In each section, I will summarize important claims and observations regarding a given factor and evaluate the extent to which each factor is expected to influence the acquisition of inflectional morphemes. Section 2.6 concludes the chapter, suggesting that, in order to capture the true role of salience in acquiring a particular morpheme, one needs to examine the cumulative effects of salience factors.

## **2.1 Phonological salience**

The ability to segment a phonological form into smaller chunks is the first step in learning that inflected words consist of root-affix combinations, and hence, the first step in learning inflection (Peters, 1982, 1997). Detection of a particular word part as an affix requires exposure to *lexical* as well as to



*paradigmatic* variation (Blom, 2003). Lexical variation refers to exposure to several instances of the same affix attached to different roots. In (2), the lexical variation is represented by a plural affix and a set of various fictive roots.

- (2) Lexical variation  
tra-PLURAL, ple-PLURAL, slo-PLURAL, zpi-PLURAL

A reoccurring affix that is attached to various lexical roots should facilitate children's ability to isolate the affix itself (in this case PLURAL). Once the affix has been isolated, a child is more readily able to discover its corresponding (meaningful) feature. For example, if the child consistently hears *These are apples and these are oranges* and already knows the nouns *apple* and *orange*, she is thought to isolate the *-s* suffix and infer that the instance of *-s* means 'more than one'.

At the same time, the child may notice that the same word forms are in paradigmatic variation. In example (3), paradigmatic variation is represented by a hypothetical root *tra-*, and a set of various affixes representing various features such as PLURAL, ACCUSATIVE, DEFINITENESS, ANIMACY etc.

- (3) Paradigmatic variation  
tra-PLURAL, tra-ACCUSATIVE, tra-DEFINITENESS, tra-ANIMACY

In theory, when children hear different affixes with the same root, they are able to compare the forms with each other and deduct the phonological information that does not overlap among the roots. Children will notice that one root expresses different meanings when different affixes are attached to it. For example, if a child hears *Yesterday it rained the whole day and today it's raining too*, she is thought to be able to isolate the form *rain* and infer that the suffixes *-ing* and *-ed* encode different features.

In all languages, children must first segment word forms in order to acquire inflection. The segmentation process, however, does not entail the same complexity across all languages. Several authors argue that the simplicity of segmenting is determined by a degree of *phonological salience*, i.e. how easy it is to detect the root and the affix in a given word form (Peters, 1997; Gillis, 2003). Brown (1973: 409) refers to phonological salience as "such variables as amount of phonetic substance, stress level, usual serial position in a sentence, and so on". In the context of this thesis, phonological salience refers exclusively to perception of the linguistic input.

Specific claims about the impact of phonological salience on acquisition of inflection (and morphology in general) are made by the Surface Hypothesis, which assumes that surface characteristics of morphology play a significant role in acquiring inflection (Leonard, Sabbadini, Leonard and Voltera, 1987; Leonard, 1989; Leonard and Eyer, 1997; Montgomery and Leonard, 1998). Originally, the Surface Hypothesis was proposed in order to explain cross-linguistic differences in acquisition of inflection by children diagnosed with Specific Language Disorder (SLI).<sup>1</sup> The main claim of the Surface Hypothesis was that children with SLI have a processing-capacity limitation that leads to difficulties in processing affixes with reduced phonetic substance: The so-called *weak* morphological markers, which are vulnerable to final consonant deletion and weak syllable deletion. Leonard defines weak morphological markers as: “Low phonetic substance morphemes are non-syllabic consonant segments and unstressed syllables, characterized by shorter duration than adjacent morphemes, and, often, with lower fundamental frequency and amplitude” (Leonard, 1989: 186).

Support for the Surface hypothesis comes from Italian (Leonard et al., 1987) and from Hebrew (Rom and Leonard, 1990). These data indicate that children with SLI perform as well as typically developing children (when matched by MLU’s) with word-final morphemes that are stressed, vocalic, and syllabic. The same children, however, performed worse than (MLU-matched, younger) typically developing children with unstressed monosyllabic inflectional morphemes.

Interestingly, cross-linguistic studies have showed that the same morphemes which pose problems for children with SLI in one language seem to be completely unaffected in another language. Leonard et al. (1987) compared the error patterns of English-speaking children with SLI and Italian-speaking children with SLI. He showed that 3<sup>rd</sup> person singular inflectional morphemes, which were prone to error in English, were relatively unaffected in the Italian SLI population. In Italian, the 3<sup>rd</sup> person singular is marked by a vowel at the end of the verb: *-a* or *-e* depending on the infinitival form, whereas in English, there is a non-syllabic unstressed suffix *-s*. These data were in line with predictions made by The Surface Hypothesis, namely, that the

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<sup>1</sup> Specific Language Impairment (SLI) is a ‘pure’ developmental language disorder in that children with SLI seem to develop normally except that they show significant limitations in their spoken language ability. Unlike children with other types of language disorders, they show no signs of hearing impairment, mental retardation, social-emotional disorders or neurological damage. They are, however, still unable to learn a language rapidly and effortlessly (Fletcher, 1999).

English speaking children would have greater difficulties than the Italian speaking children with the 3<sup>rd</sup> person singular form because the Italian form is syllabic and word final whereas the English suffix is non-syllabic and vulnerable to final consonant deletion. Italian children with SLI, however, also performed poorly with inflectional morphemes that lacked phonological salience.

The findings about the role of phonological salience in acquisition of inflection are not restricted to data from children with SLI. Typically developing Italian children are also reported to experience greater difficulties with phonologically less salient morphemes (Leonard et al., 1987). Similar results were also obtained in a cross-linguistic study conducted by Smoczyńska (1985). Smoczyńska compared the acquisition of case inflection in typically developing Russian and Polish children. She found that, although the inflectional systems are almost identical in terms of morphosyntactic features, Polish children tended to acquire the case system with greater ease than the Russian children. According to Smoczyńska, the critical factor turned out to be phonological: Unstressed final vowels that distinguish cases were reduced to schwa in Russian but not in Polish, thus making the task more difficult for the Russian child.

Based on analyses of various cross-linguistic data, Slobin (1985) argued that children prefer phonologically salient inflectional morphemes over non-salient ones, despite the fact that children sometimes produced the non-salient morphemes first. Slobin documented a phenomenon referred to as ‘inflectional imperialism’, which he defined as complete or almost complete replacement of competing inflectional patterns by a different single form. Thus, he claims that sometimes children first use a (phonologically unsalient) correct affix and only later, is that affix driven-out by a more salient affix. In Slobin’s reports of Russian children (1966), the driven-out forms were predominantly zero morphemes, which are inflectional forms which completely lack phonological substance. Smoczyńska (1985) observed the same pattern in Polish. Slobin claims that children use this to develop a type of default. He states: “if you fail, use only the most salient and applicable functor to express the given notion in the given position” (1985: 1219).

Given the proposals and the observations provided by various studies, I can conclude that phonological salience has a strong impact on the ability to process and segment root-affixes. It has been shown that children notice the phonologically salient morphemes before the phonologically non-salient ones. Crucially, a morpheme’s level of phonological salience is dependent on the

presence or absence of a (full/reduced) vowel: Inflectional morphemes containing a full vowel as in (4a) are more salient than those containing a reduced vowel (i.e. schwa), as in (4b). Inflectional morphemes containing a reduced vowel are more salient than inflection without a vowel as in (4c) and finally, inflectional morphemes marked by zero morphemes, as in (4d), are considered non-salient.

- (4) a. (he is) walk – *ing*  
 b. (he) walk – *ed*  
 c. (he) walk – *s*  
 d. (they) walk –  $\emptyset$

On the basis of the observations summarized in this section, I have formulated a scale of phonological salience for inflectional morphemes in (5).

- (5) full vowel > reduced vowel > no vowel > zero morpheme

The implicational scale presented in (5) also makes it possible to make predictions about ease of acquisition. Specifically, it implies that more phonologically salient morphemes will be acquired earlier than less phonologically salient morphemes. Thus, children are expected to acquire syllabic affixes earlier than non-syllabic affixes. The scale in (5), for example predicts that an English-speaking child will acquire the syllabic suffix *-ing* earlier than the non-syllabic *-s*. This prediction is supported by empirical observations regarding acquisition of English morphology (e.g. Brown, 1973; Smolík, 2005).

## 2.2 Positional salience

Positional salience has to do with the tendency for children to focus more on lexical items that are in utterance-final position, as exemplified in (6a) or in word-final position, as exemplified in (6b).

- (6) a. I'm waiting for the *bus*  
 b. *waiting*

A number of studies suggest that positional salience plays a role in predicting children's early word production and perception. For example, a perception

experiment with one-year-olds showed that recognition of a recently learned word is better if it occurs in utterance-final position (Fernald and McRoberts, 1993). Similarly, Shady and Gerken (1999) found that two-year-olds performed better in a picture identification task when the target words were presented at the ends of a sentence. The authors claimed that the element in utterance-final position is prosodically highlighted, which is thought to facilitate children's acquisition.

Various production studies have also demonstrated that acquisition speed is also affected by how frequently an item occurs in the utterance-final position (Gillis and Verlinden, 1988; Naigles and Hoff-Ginsberg, 1998). Wijnen, Kempen and Gillis (2001), however, found that infinitival verb forms are often acquired earlier than their input frequency would predict. Wijnen et al. (2001) analyzed longitudinal spontaneous speech data from two monolingual Dutch boys: Peter and Matthijs (available via CHILDES, MacWhinney, 2000). The authors suggest that position is likely to have a stronger impact than frequency. They argue that, in Dutch, the early emergence of infinitives is best explained by a combination of factors: Positional salience, frequency related to lexical variation, and the relatively high semantic salience of infinitives as compared to finite verbs.

Positional salience has also been shown to influence the learning of computational models. Freudenthal, Pine, and Gobet (2003), for example, showed effects of positional salience with the computational model: MOSAIC (Model of Syntax Acquisition in Children). Like children, MOSAIC learns from naturalistic input. The artificial learner produces utterances that can be directly compared with children's utterances. MOSAIC shows that young children's tendency to use both correct finite verbs and incorrect optional infinitives can be explained by input frequency in combination with an utterance-final bias.

In 1973, Slobin proposed that language learners find word-final affixes particularly salient. Based on Peter's (1982) work on segmentation, and on extensive cross-linguistic research of more than 40 languages, Slobin (1985: 1038) formulated the following operating principle: "Pay attention to the last syllable of an extracted speech unit". In support of this principle, Slobin presents cross-linguistic evidence from children's acquisition of case inflection and their acquisition of articles. Slobin notes that children learning languages which are rich in inflection (i.e. Russian, Polish, Serbo-Croatian, Finnish, Hungarian, and Turkish) tend to use morphemes that encode the ACCUSATIVE

and the DATIVE. In these languages, these particular morphemes are coded as noun suffixes. Children learning German, however, acquire these morphemes relatively late in acquisition (Stern and Stern, 1907: reference cited in Slobin, 1973), presumably because they are realized as forms of pre-nominal articles. In his analysis, Slobin considers the *article + noun* combination as a single unit and not as two separate lexical items.

Similarly, a cross-linguistic comparison of article acquisition reveals that English articles (which are prenominal, e.g. *a roof* or *the garden*) are much slower to develop than the definite article in Bulgarian (which is a noun suffix, e.g. *gradina -ta* ‘the garden’) (Brown, 1973; Gheorgov, 1908: reference cited in Slobin, 1973). Slobin (1973) interprets these findings as evidence that there is no morphosyntactic feature absent from children’s early language. Instead, he argues that young learners pay attention to the last syllable of the extracted speech unit. However, upon further analysis of the examples provided by Slobin, it could also be that children are simply better at acquiring bound morphemes (i.e. word formation) than they are at acquiring free morphemes (i.e. constituent formation).

Counter evidence to this claim and evidence for the claim that positional salience does play a role in acquisition of affixes comes from a study by Daneman and Case (1981), in which English-speaking children were taught artificial inflection rules. In this study, children learned two nonce verbs: *pum* and *bem*. In addition, the children were taught that the form that the verb takes is dependent on the number of animals who witnessed the action. If the actions were observed by one animal, the verbs were suffixed as *pum -abo* or *bem -abo*; and if the actions were observed by several animals, the verbs were prefixed as *aki- pum* or *aki- bem*. The researchers hypothesised that if children were indeed paying greater attention to the word-final morphemes, then the suffixed verbs should be acquired earlier than the prefixed verbs. The results of the study showed that this was indeed the case.

The aforementioned studies support the notion that positional salience has a strong impact on children’s acquisition of lexical items as well as their acquisition of inflectional morphemes. The overarching prediction is that elements which occur in utterance-final position or in word-final position should be acquired earlier than elements that occur in other positions.

### 2.3 Feature salience

It has been hypothesized that grammatical features underlying all languages are highly salient and hence, expected to surface early in children's language (e.g. Pinker, 1984). A salient feature is one which can be referred to in the world. Salience of morphosyntactic features has been proposed to play a significant role in development of grammar (Slobin, 1973; Pinker, 1984). Features are defined as elements into which linguistic units, such as words, can be broken down. Examples of morphosyntactic features include NUMBER (SINGULAR, PLURAL, DUAL...), PERSON (FIRST, SECOND, THIRD), CASE (NOMINATIVE, ACCUSATIVE, LOCATIVE...), GENDER (FEMININE, MASCULINE, NEUTER) and so on. However, it is important to note that the manifestation of features varies across languages. In Dutch, for example, attributive adjectives are marked for NUMBER, DEFINITENESS and GENDER. In other languages, some of these features are unmarked. A language could also express features other than those expressed in Dutch, for example ANIMACY.

Although cross-linguistic comparisons demonstrate a great deal of variation with respect to features, there have been attempts to make cross-linguistic generalizations. Greenberg (1963), for example, observed that features cluster according to general patterns such that 'no language has a dual unless it has a plural' (Universal 34, Greenberg, 1963: 94). Talmy (1985, 1988) showed that many features seem to be excluded from grammatical expression. For example, there is no known language where verb inflectional morphemes distinguish whether an event occurred in the daytime or night time, nor are there any known languages that include verb inflections that encode whether the speaker is bored or interested. Talmy (1985) provides a list of features that are typically realized as verb affixes or particles. He contrasts this list with a list of features that are not grammatically encoded on verbs. Examples from the two lists are given in (7).

(7) a. *grammatically encoded features*

- tense
- aspect
- causality
- voice
- mood
- person

- number of event participants
  - gender of the participant
  - speaker's evidence of making claim (e.g. hearsay)
  - personation (action on self vs. other)
  - speech act type
  - social status of interlocutors
  - positive or negative status of an event's existence
- b. *non-grammatically encoded features*
- color of an event participant (occurrence during night or daytime, a cold or a hot day)
  - speaker's state of mind (e.g. bored, interested)
  - spatial setting (e.g. indoors/outside)
  - etc.

Talmy's extensive typologically research is related to an earlier proposal which holds that there exists a set of universal semantic primitives underlying all languages (Postal, 1966; Bierwisch, 1967; Bickerton, 1981). According to Postal, the semantic primitives are innate items. What must be learned, Postal maintains, is only the mapping between fixed sets of semantic primitives and sets of phonological and syntactic properties. It should be explicitly noted, however that children must also be able to first detect those primitives which receive lexical/grammatical expression in her language, and those which do not.

Some researchers have adopted Greenberg's typological universals and Talmy's analysis of grammatical features to explain how children learn inflectional paradigms and how they learn to map forms and features. For example, Slobin (1985: 1173), referring to the grammatically encoded features in Talmy's list (7a), suggested that "such notions must constitute a privileged set for the child, and that they are embodied in the child's conceptions of 'prototypical events' that are mapped onto the first grammatical forms universally". Pinker (1984) takes a similar position by saying that "the child can extract [...] the potentially grammatically relevant semantic features of the sentence participants (their NUMBER, PERSON, GENDER, etc.) ..." (1984: 30). The issue regarding whether the features are innate or whether they arise from prior experience is not relevant, as long as the child is, at some point, able to detect the features. Pinker put forth a model that works on a pre-established



ranking of features. The highest ranked features are most likely to appear early in the ambient language. Thus, if a child were able to capture the relevant features, she would be spared the task of initially scanning the entire inventory of grammatical features by ‘weighting of hypotheses’ based on ‘cognitive salience’ (Pinker, 1984: 170). Pinker’s feature accessibility hierarchy corresponds to the frequency of occurrence of grammatical features in the languages of the world (see also Bowerman, 1985).

More recently, Harley and Ritter (2002) have proposed a feature hierarchy which aims to capture typological universals as well as developmental patterns in language acquisition in pronominal systems. The hierarchy is empirically sound and captures a wide range of languages. Although the main focus is on pronouns, the hierarchy can also be applied to verbal inflection: In order to express agreement relation between a (subject) pronoun and a verb, the same morphosyntactic features are at play. I will not go into details of the hierarchical organization, as these are not important for the purposes of this thesis. Instead, I will focus on the relevant information that the hierarchy provides with respect to acquisition of verbal inflection.

According to Harley and Ritter, children first make a morphological contrast between [+SPEAKER] and [-SPEAKER], after which, they acquire morphemes that encode the feature [+ADDRESSEE]. Children are also expected to express the feature [-PLURAL] earlier than the feature [+PLURAL]. In (8), I summarize the predictions for acquisition of verbal inflection that are in line with Harley and Ritter’s hierarchy.

- (8) a. [+SPEAKER] = [-SPEAKER] > [+ADDRESSEE]  
 b. [-PLURAL] > [+PLURAL]

Based on the hierarchy in (8), I can predict variation across children: Children either start with the singular form marked for [+SPEAKER; -ADDRESSEE] (i.e. 1<sup>st</sup> person) or with the singular form marked for [-SPEAKER; -ADDRESSEE] (i.e. 3<sup>rd</sup> person). The study of child Italian (Leonard et al., 2002) seems to support this prediction. These authors report that two- and three-year old children overuse these two forms when they do not realize the correct verbal agreement (see also Chapter 1, Section 1.2).

On the assumption that children will seek morphosyntactic expression for the most salient features that they can refer to, it is expected that features with direct referents in the world such as NUMBER or PERSON will be expressed first

in any given language. However, this prediction seems to be contradicted by studies investigating acquisition of grammatical GENDER. It is crucial to mention that GENDER represents two distinct concepts: (1) it refers to natural gender; that is, it corresponds to male and female distinctions in human beings or sexed animals; and (2) it refers to an agreement feature called ‘grammatical gender’, which is unrelated to natural gender. According to Adger (2003: 40) “Many languages have what is called grammatical gender, where words are assigned a gender category (masculine, feminine, neuter) which bears no obvious semantic relation to what the word refers to”. It is clear that grammatical GENDER is a morphosyntactic feature that does not necessarily have referents in the world. This means that grammatical GENDER is rather a property of individual nouns and not of the referents of those nouns. This property shows up in a process of syntactic agreement.

Given the characteristics above, grammatical GENDER is less salient than NUMBER. Therefore, grammatical GENDER is expected to be acquired later. Various studies have shown, however, that despite its low feature salience, grammatical GENDER surfaces early in the development. For example, Karmiloff-Smith (1979) carried out experiments with French-speaking children between ages 3;2 and 12;5, in order to explore their acquisition of determiners. In these experiments, nonce nouns were used to learn about the types of cues that children use in attributing gender and marking gender agreement. Karmiloff-Smith observed a preference for phonological cues in children up to the age of nine. Reliance on phonological cues was gradually replaced by reliance on semantic cues, although the phonological cues were never completely abandoned. Using a procedure very similar to Karmiloff-Smith’s, Pérez-Pereira (1991) conducted a study on gender acquisition by Spanish-speaking children. In this study, he observed the same gender attribution strategies. Slobin (1985) reported that in Slavic languages, the gender categories are acquired later when they do not follow the general pattern of the phonological regularities (see also Polišenská, 2006 and Rodina, 2006 for similar observations in Czech and Russian, respectively). In line with these findings, grammatical gender in Dutch, which has almost no morphophonological or semantic correlates, has been reported to surface relatively late in children’s development (Deutsch and Wijnen, 1985; Van der Velde, 2003).

In sum, I expect that, out of the set of grammatically encoded features, children will first express salient features because these features are meaningful since they correspond to natural classes with direct referents in the world. Some examples of salient features include PERSON and NUMBER. However, studies

strongly suggest that, despite its low feature salience, grammatical GENDER may surface early in children's language due to other factors such as phonological regularities. Importantly, the observations about children's acquisition of grammatical GENDER indicate that children pay attention to various factors during acquisition. I will come back to this in the final section in this chapter, and once again in Chapter 3.

## 2.4 Feature complexity

Feature complexity refers to how many morphosyntactic features are associated with a particular morpheme. For example, the nominal plural marker *-s* in English (e.g. *tables*) only requires knowledge about whether the number of referents is singular or plural. On the other hand, the present tense marker *-s* (e.g. *he talk<sub>s</sub>*) requires knowledge about whether the subject is singular or plural, whether it is a first, second, or third person, and whether the event is in the present tense. Brown (1973) established a complexity hierarchy, which predicted that morphemes that encode more features are more difficult to learn than morphemes associated with fewer features. Similarly, Clark (1993) argued that an inflection system, which allows children to map form and feature on a one-to-one level (i.e. an inflection system where one morphological form corresponds to one morphosyntactic feature), is expected to be acquired earlier than an inflection system where children have to map many features to one single form.

According to Pinker (1984), the differences that underlie the process of form-feature mapping are reflected, cross-linguistically, in children's development (see also MacWhinney, 1978). In order to account for cross-linguistic variation and, in particular, for the well-known differences between agglutinating and fusional languages, Pinker put forth a hypothesis about how learners build paradigms. To explain how the hypothesis works, consider first the examples in (9), where we have the declension of the word *house* in Turkish (agglutinating inflection) and Czech (fusional inflection).

(9)

a. Turkish/agglutinating inflection

	NOM <i>house</i>	GEN <i>of a/the house</i>	LOC <i>in a/the house</i>
SG	ev	ev <i>-in</i>	ev <i>-de</i>
PL	ev <i>-ler</i>	ev <i>-ler -in</i>	ev <i>-ler -de</i>

## b. Czech/fusional inflection

	NOM <i>house</i>	GEN <i>of a/the house</i>	LOC <i>in a/the house</i>
SG	dům	dom -u	(v) dom -ě
PL	dom -y	dom -ů	(v) dom -ech

The example in (9a) clearly shows that in Turkish, the same suffix encoding CASE (GENITIVE or LOCATIVE) is attached to the singular and the plural form. PLURAL is always signalled separately by the same suffix. Since each suffix corresponds to only one feature, more than one suffix is needed, since words are marked for both PLURAL and CASE. Czech, on the other hand, never has more than one suffix. Instead, each suffix expresses NUMBER, CASE, GENDER and ANIMACY simultaneously.

Following Pinker (1984), learning inflection is a process where children learn about morphosyntactic features that underlie the inflectional paradigm (e.g. NUMBER, GENDER, PERSON or CASE) through systematic hypothesis testing. This implies that the learner uses information from the environment and tries out “hypotheses” about the target language in order to learn about inflectional properties of the paradigm. This process of learning is also called the trial-error learning strategy. Agglutinating inflection, which is associated with one-to-one form-feature mapping, is simple in terms of feature complexity. In languages such as Turkish, Hungarian or Finnish, a single affix corresponds to a single feature. The affixes are ordered in fixed and linear order, as exemplified in (10).

(10) noun + *suffix* [PLURAL] + *suffix* [POSSESSIVE] + *suffix* [LOCATIVE]

In agglutinating languages, paradigm learning involves a gradual expansion from one to more features. Basically, the learner starts out with an initial hypothesis about the relation of a certain morpheme to a certain feature, e.g. PLURAL. Gradually, more hypotheses about the correspondence between morphemes and features are introduced. As example (11) illustrates, with a noun like *ev* ‘house’, a learner of Turkish adds each feature such as PLURAL, POSSESSIVE or LOCATIVE to the noun as separate morphemes.

(11) *ev-ler-im-de* [PLURAL; POSSESSIVE; LOCATIVE] ‘in my houses’

In contrast, fusional inflection is associated with different levels of feature complexity, since multiple features can be expressed by a single morpheme. This can be seen in example (12), where suffixes *-ĕ* and *-ech* express a bundle of features [SINGULAR; LOCATIVE] and [PLURAL; LOCATIVE].

- (12) a. noun + *suffix* [SINGULAR; LOCATIVE]  
 dom *-ĕ*
- b. noun + *suffix* [PLURAL; LOCATIVE]  
 dom *-ech*

As is the case in agglutinating languages, children acquiring fusional languages start out with a simple hypothesis. For example, a child might first isolate an inflectional morpheme, then map it to a single feature, i.e. [PLURAL]. In this respect, there is no difference between the acquisition of agglutinating languages and fusional languages. As the learner notices that the paradigm exhibits more inflectional contrasts than is predicted by the initial simple hypothesis, she must add more features and test whether the paradigm conforms to the adjusted feature space. Because the feature complexity in fusional languages is higher than that in agglutinating languages, it is expected that children will take longer to master paradigms in fusional languages. According to Pinker (1984), the more features the fusional paradigm exhibits, the more complex set of calculations the child must perform.

A number of cross-linguistic investigations support this prediction. For example, research focusing on the acquisition order of inflectional contrasts demonstrates that verbal and nominal inflectional morphemes were first acquired in agglutinating languages, such as Turkish and Finnish (at the age of 1;8) (for the early acquisition of Turkish morphology in general see Aksu-Koç and Slobin, 1985; Aksu-Koç and Ketrez, 2003). In a study of child Hungarian, Gábor and Lukács (2006) showed that typically agglutinating noun inflectional morphemes were productive at the age of 2;10, whereas the more fusional verb inflectional morphemes were mastered at the age of 4;7, revealing a developmental difference of almost two years. In contrast, children acquiring fusional inflection systems tended to overuse morphemes and needed more time before they inflected correctly (e.g. Slobin, 1977, 1985; Bittner et al., 2003).

In conclusion, feature complexity predicts that an inflectional morpheme is considered more salient when it encodes fewer morphosyntactic features.

This implies that the fewer features a morpheme encodes, the sooner it should be acquired. Thus, an inflectional morpheme that is associated with a single feature is expected to be in place earlier than an inflectional morpheme that is associated with a bundle of features.

## 2.5 Input frequency

The question about whether acquisition of inflectional morphemes can be ascribed to input frequency remains controversial. In the literature, there are indications that children's output is significantly affected by statistical regularities, and that children tend to acquire the forms that occur most frequently in their input early (e.g. Pine, Lieven and Rowland, 1998; Serratrice, Joseph and Conti-Ramsden, 2003). It has been suggested that input frequency, in combination with other factors, can also explain why children acquire some inflectional morphemes before others (e.g. Brown, 1973; Wijnen et al., 2001). This section provides a brief summary of the relevant empirical investigations.

Serratrice, Joseph and Conti-Ramsden (2003) reported on a significant correlation between the order of acquisition of regular/irregular English past tense forms and parental input frequency. They concluded that frequency is a relevant factor since the output of the investigated children closely resembled the input distributions of the regular and the irregular past tense forms.

Pine, Lieven and Rowland (1998) looked at input frequency effects in children's use of tensed and untensed (infinitive) verb forms. They counted the frequencies of tensed and untensed verbs in the input of twelve English-speaking mothers, and found that the relative input frequencies were highly similar across participants. Pine et al. showed a strong, significant correlation between the age of acquisition of finite and non-finite forms and input frequency. Based on this outcome, Pine et al. conclude that frequency of occurrence in children's input is a powerful predictor of the acquisition order of finite and non-finite forms in English.

Similarly, Schlichting (1996) observed that Dutch children tend to acquire the verb form that appears most frequently in their input, and therefore suggests that there is a relationship between the input frequency and the acquisition order:

“A verb which is more frequent in finite form(s) than in non-finite form(s) in Child Directed Speech is (first) acquired in finite form(s); a verb which

is more frequent in non-finite form(s) than in finite form(s) in Child Directed Speech is first acquired in non-finite form(s)”(Schlichting, 1996: 118).

However, there is also evidence that the relationship between input frequency and order of acquisition is not as straightforward as suggested by the studies summarized above. Brown (1973), who concentrated mainly on the acquisition of early child English morphology, was the first to document a limited role of input frequency with respect to the acquisition order of morphological forms. In his analysis, he did not find any detectable relationship between the input frequency of the 14 grammatical morphemes and their order of acquisition (but see Moerk, 1978 for a reanalysis of Brown’s data and different results).

Similar to Brown, Smolík (2005) investigated frequency effects on the acquisition of English grammatical morphemes. Smolík’s research included noun plurals, regular and irregular past tense forms, 3<sup>rd</sup> person singular and progressive. He reported that input frequency, by itself, was not a crucial causal factor in the acquisition order of the investigated categories. Smolík observed that the effect of input frequency on the acquisition of inflectional morphemes differed per category. Input frequency was found to influence the acquisition of noun plurals and the regular past tense more than it influenced the progressive and past tense irregular inflectional morphemes. Further, the acquisition of 3<sup>rd</sup> person singular did not seem to be affected by the input frequency. Smolík suggested that there must be some other factor that makes progressives easier to acquire than 3<sup>rd</sup> person singular forms.

Gillis and Verlinden (1988) analysed input effects in a Dutch-speaking child from 0;11 – 1;11. This study showed that the most frequent verbs that the child heard were finite modals, auxiliaries, and copulas. Gillis and Verlinden observed that, despite their high frequency, these types of finite verbs appeared later in the child’s output than infinitives, which were reported to be less frequent in the input.

The study by Wijnen et al. (2001), as mentioned in Section 2.2, also revealed only moderate correlations between frequency of verb forms in the input and the age of first appearance. Wijnen et al. analyzed the order of acquisition of finite and non-finite forms of lexical verbs in relation to the input frequency. The first step was to identify the lexical verbs that appeared in both finite and non-finite forms in children’s speech. The next step was to determine the input frequency of these forms and relate the frequencies to the order of

acquisition. Wijnen et al. found that Dutch children almost always produce the non-finite form of lexical verbs before they produce the finite forms, despite the fact that non-finite forms are sometimes less frequent than finite forms. This outcome led Wijnen et al. (2001) to the conclusion that frequency is not the only factor that accounts for the early acquisition of non-finite forms. They suggested, instead, that combination of factors contributes to the salience of verb forms. In Dutch, the finite form often occurs in utterance-final position. The authors claimed that this position is quite salient, and that children's sensitivity to this position can explain the early emergence of this particular form.

Hsieh, Leonard and Swanson (1999) also concluded that other salience factors besides input frequency are at play. Hsieh et al. showed that frequency, in combination with positional salience affects the developmental order of inflectional morphemes. They observed, for example, that the plural *-s* (as in *two rabbits*), which is acquired before the homophonous 3<sup>rd</sup> person suffix (as in *she loves him*), occurred more frequently in the salient unit-final position.

Given both the studies that support the notion that input frequency affects morphosyntactic development as well as the studies that do not, it is logical to wonder what might be responsible for the conflicting findings. The conflicting results might be due to the fact that studies use different methods to calculate frequency. Token-based frequency refers to a simple count of all forms whereas type-based frequency corresponds to a calculation of a specific type of morphological form. It has been proposed that for children's inflectional morphemes to become productive, type frequencies in the input are more effective than token frequencies (Clark, 1993). That is, children's default pattern is strongly influenced by the number of types of a particular morpheme heard in the input. Evidence for this position comes from studies investigating overusage patterns in inflection development. For example, more than 90% of French verbs belong to the highly regular first-conjugation (*-er*) but many of the verbs used most frequently with young children are irregular and belong to the third-conjugation (*-re*). Investigation of children's verb usage showed that children consistently regularize third-conjugation verbs by overusing the first-conjugation inflection, despite the fact that they hear many more third-conjugation verb tokens than they do first-conjugation verb tokens (Guillaume, 1927: reference cited in Clark, 1993).

Following Clark (1993), I assume that it is easier to detect and isolate an inflectional affix when it occurs with a variety of different lexical roots (types). For example, it would be easier to detect the recurrent 3<sup>rd</sup> person singular



inflection *-s* if it occurred with several words: *reads, walks, cooks, falls, breaks* than if it was heard repeatedly with a single word: i.e. *reads, reads, reads, reads, reads*. That is, the more types of a given morpheme in the input, the more accessible the morpheme should be and the earlier children should acquire it. Token frequencies are less relevant for the development of inflection. In the example above, the child would have heard five instances of the 3<sup>rd</sup> person singular *-s* in each situation. In the later context, however, she would have a difficult time separating the root from the suffix since she wouldn't have heard the suffix with any variation. Consequently, she would be expected to have difficulties separating the root from the suffix and would be likely to store the entire word *reads* in her mental lexicon.

The empirical findings make it clear that it would be too simple to say that children learn frequent forms before infrequent forms. In the case of agreement inflection, we have seen that there is more to it than a mere token or type frequency count of items from the input. Further, it seems very likely that the salience of any given morpheme is dependent on the input frequency as well as on a variety of other salience factors.

## 2.6 Concluding remarks: Cumulative effects of salience factors

In this chapter, I have addressed five factors that have been proposed to contribute to the salience of inflectional morphemes: Phonological salience, positional salience, feature salience, feature complexity and input frequency. The main observation within each factor is that, in the early developmental stages, children seem to acquire the more salient morphemes before the less salient ones. In (13) – (17), I summarize predictions that result from these factors.

- (13) *Phonological salience*: Phonologically salient morphemes will be acquired earlier than less phonologically salient morphemes: It is expected that children acquire morphemes that contain a full vowel prior to morphemes that contain reduced vowel. The acquisition of morphemes containing no vowel is expected to follow the acquisition of morphemes containing full or reduced vowels. Zero morphemes are expected to be acquired last.

- (14) *Positional salience*: Morphemes placed in the final position of an utterance (sentence level) or of an extracted speech unit (word level) are acquired earlier than morphemes placed in the front or in the middle-position.
- (15) *Feature salience*: Morphosyntactic features that correspond to natural classes with direct referents in the world are considered conceptually salient and, hence, expected to be expressed earlier than morphosyntactic features without these properties.
- (16) *Feature complexity*: An inflectional morpheme is considered salient when it encodes fewer morphosyntactic features: The fewer features a morpheme encodes, the sooner it should be acquired.
- (17) *Input frequency*: The higher the frequency of a given inflectional morpheme in the child's input, the earlier its acquisition.

To date, most investigations examining salience as a factor in children's developmental patterns have focused on a single factor such as input frequency (e.g. Serratrice et al. 2003; Smolík, 2005) or phonological salience (e.g. Leonard et al. 1989). Although this is a very understandable research strategy, it leads to a scattered picture that does not represent the issue in its full complexity. In fact, in most of these studies, researchers acknowledge that it is not a single factor but instead, an accumulation of factors that make certain morphemes more salient than others. Consequently, one would expect that it is not a single factor but an accumulation of factors that explain the order in which children acquire inflectional morphemes (e.g. Brown, 1973; Leonard, 1989; Wijnen et al., 2001; Smolík, 2005).

I hypothesize that in the early developmental stages, children's attention is drawn to the most salient morphemes. Given the likelihood that it is a variety of factors that influence the accessibility of a morpheme, I believe that an explanation of inflectional development which takes into account, all of the factors (13) – (17), should be very promising. In order to approach this task, however, one must devise a method which measures the cumulative effects of the salience factors by weighing them in terms of their relevance. One model which seems to be related to the current research strategy is the Competition model (henceforth: CM) of MacWhinney (1987), Bates and MacWhinney (1989), and MacWhinney and Chang (1995). Similar to my own goals, the CM acknowledges that several different cues aid in the language development

However, the CM differs from my aims here since it focuses “on inflections as cues to underlying thematic roles and pragmatic functions” (Kempe and MacWhinney, 1998: 545). In other words, whereas the CM examines inflections as cues to learn other properties of language, the present study does not look into whether or not inflectional morphemes are cues to learn underlying functions, but instead, aims to determine whether salience factors can account for variation in the acquisition of agreement inflection.

As for now, my method is explorative and represents one possible way to measure salience of morphemes. In order to assess the cumulative effects of the salience factors, I will base my method on an assumption that the factors in (13) – (17) have equal weights, i.e. all factors are considered equally relevant in their contribution to salience. In Chapter 3 I will address this method in more detail.



# 3

## Salience of Dutch inflection

In Chapter 2, I outlined five factors that make an inflectional morpheme salient. I argued that, in order to capture the complex role of salience in the acquisition of agreement inflection, it is important to examine the cumulative effects caused by the interplay of various salience factors. Based on the assumption that all salience factors have equal weight, I briefly introduced a method which will be used to assess the cumulative effects of salience factors and predict the order, in which Dutch children acquire inflectional morphemes. Assuming that children's attention is drawn to the most salient morphemes, I hypothesized that the most salient morphemes are acquired first, followed by less salient morphemes. Similarly, the least salient morphemes are expected to be acquired relatively late in development.

The contents of this chapter are organized as follows: In Section 3.1, I will describe the properties of Dutch verbal and adjectival inflection. This is relevant for understanding this chapter as well as the remainder of this thesis. Section 3.2 describes a procedure which will be used to assess the level of salience in Dutch inflection. Sections 3.3 and 3.4 focus on salience within verbal and adjectival inflection, respectively, whereas Section 3.5 compares salience between the two paradigms. Predictions about acquisition are formulated at the end of each of these sections. Section 3.6 provides an overview of what is known about the development of verbal and adjectival inflection in typically developing children acquiring Standard Dutch.<sup>2</sup> The aim of this section is to evaluate whether the established empirical findings are in line with my predictions. Section 3.7 addresses some unanswered questions, which are important for gaining a more

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<sup>2</sup>There are many Dutch dialects that have verbal and adjectival paradigms which differ substantially from the standard paradigms (Taeldeman (1980), Nijen Twilhaar (1990), Bennis and MacLean (2006), Aalberse (2009), Barbiers, Bennis and Vogelaer (2006), MacLean [in preparation]). Since there has been little research on Dutch-speaking children's acquisition of Dutch dialects the overview is limited to the Dutch standard variety.

thorough understanding of the development of agreement inflection in Dutch monolingual children.

### 3.1 Properties of Dutch inflection

#### VERBAL INFLECTION

Dutch finite verbs encode the categories TENSE, NUMBER and PERSON. The expression NUMBER and PERSON agrees with the subject of the clause in which the finite inflection appears. TENSE is usually not considered part of agreement inflection because the choice of the correct tense inflection is not determined by the syntactic structure in which it appears (Booij, 2002; but see Zeijlstra, 2008 for a different view). Dutch regular lexical verbs have a stem, to which a suffix is added.<sup>3</sup> For the present purposes, it is irrelevant whether or not a zero morpheme is considered a covert suffix or as simply ‘no spell-out’. Henceforth, the zero morpheme will be indicated as  $-\emptyset$ . Table 3.1 illustrates the verbal paradigm in the present tense. It includes in the regular lexical verb *dromen* ‘to dream’ which uses with three different suffixes:  $-\emptyset$  is used for 1SG and for 2SG-INV;  $-t$  for 2SG and 3SG and  $-en$  for all plural forms, irrespective of person.

**Table 3.1: Dutch finite verbal paradigm for regular verbs in present indicative**

PERSON and NUMBER	Inflection	Example ( <i>dromen</i> ‘to dream’)
1SG/2SG-INV	stem + $\emptyset$	<i>Ik droom/ droom jij</i>
2SG /3SG	stem + <i>t</i>	<i>Jij droomt/ hij, zij, het droomt</i>
1-3PL	stem + <i>en</i>	<i>Wij, jullie, zij dromen</i>

<sup>3</sup> As is the case in many other languages, there is a distinction in Dutch between lexical verbs, modal verbs, copulas, and auxiliaries. The inflection of lexical verbs in present tense contains three distinct inflectional morphemes unless the stem ends with  $-t$ , in verbs such as *zitten* ‘sit’ or *eten* ‘eat’. The paradigm of modals, copulas and auxiliaries differ from that of lexical verbs. For example, these paradigms include irregular forms and suppletive forms.

Note that Dutch has been analyzed as having a SOV/V2 typology (Koster, 1975). This implies that, in Dutch declarative main clauses, the finite verb moves to second position, where it precedes the object, negation, particles etc. In contrast, the finite verb in subordinate clauses, and the infinitive remain in final position. I will not go into the rules of verb placement in detail, as they are not relevant for the background of this thesis (for the standard analysis of Dutch, refer to Koster, 1975 and to Den Besten, 1983). It is sufficient to know that Verb Second is restricted to finite verbs in root sentences and that the non-finite verbs (i.e. the infinitive, the perfective/passive participle and the present participle) occupy a position at the right-hand side of the verb's object (if there is one). The infinitival verb is morphologically similar to finite plural verbs in the present tense and is marked with the suffix *-en*. Example (1) gives a declarative sentence with a finite main verb, whereas (2) illustrates a declarative sentence with a finite modal auxiliary and an infinitival verb.

(1) *wij lop -en langs de rivier*  
 we walk -FIN along the river  
 'we walk along the river'

(2) *wij kunnen langs de rivier lop -en*  
 we can -FIN along the river walk -INF  
 'we can walk along the river'

### ADJECTIVAL INFLECTION

With respect to adjectival inflection, Dutch makes a syntactic distinction between attributive (prenominal) and non-attributive adjectives (for a detailed overview of a Dutch adjectival system, see Broekhuis, 1999). Non-attributive adjectives have no overt suffix, as illustrated in (3). The example in (4) shows that, in attributive position, the adjective is inflected with a *-e* suffix.

(3) *de rivier is lang/\*lange*  
 the river is long  
 'the river is long'

(4) *een \*lang/lange rivier*  
 a long river  
 'a long river'

In contrast to non-attributive adjectives, Dutch attributive adjectives are overtly inflected. The rule is: Always add *-e* to an attributive except if the noun is singular and has neuter gender and the determiner is indefinite. Absence of *-e* is a special case, in which a bare adjective must be used.<sup>4</sup> Table 3.2 gives a description of feature contrasts and morphological contrasts in the attributive adjectival inflection system in Dutch. In the first column, I list the bundles of features that are encoded. The second column gives the corresponding morphological form (i.e. the suffix) of the adjective, followed by an example in the third column.

**Table 3.2: Contrasts in attributive adjectival inflection in Dutch**

Context	Suffix	Example
DEF, NEUT, SG	<i>-e</i>	<i>Het mooie huis</i> ‘The nice house’
INDEF, NEUT, SG	<i>-∅</i>	<i>Een mooi huis</i> ‘A nice house’
DEF, COM, SG	<i>-e</i>	<i>De mooie auto</i> ‘The nice car’
INDEF, COM, SG	<i>-e</i>	<i>Een mooie auto</i> ‘A nice car’
DEF, NEUT, PL	<i>-e</i>	<i>De mooie huizen</i> ‘The nice houses’
INDEF, NEUT, PL	<i>-e</i>	<i>Mooie huizen</i> ‘Nice houses’
DEF, COM, PL	<i>-e</i>	<i>De mooie auto’s</i> ‘The nice cars’
INDEF, COM, PL	<i>-e</i>	<i>Mooie auto’s</i> ‘Nice cars’

Note that a noun’s grammatical gender has effect on the spell-out of adjectival inflection in [INDEF; NEUT; SG] and [INDEF; COM; SG]. This implies that a

<sup>4</sup> In Dutch, there exist other attributive adjectival contexts, in which the *-e* suffix does not appear. For example *een groot zanger* ‘a great singer’. For detailed description of conditions underlying these specific contexts I refer again to Broekhuis (1999).



learner has to acquire a noun's grammatical gender in order to realize the correct agreement in the adjectival inflection. Accordingly, it is necessary to expand upon the relevant properties of the Dutch gender system.

Dutch has a two-way gender system that distinguishes between neuter and common nouns. Dutch nouns are thus divided into two groups on the basis of the definite determiner they select in the singular. Nouns that take the singular definite determiner *de*, as in (5), are called *de-words* and are referred to as having common gender. Nouns that take the singular definite determiner *het* as in (6) are called *het-words* and have neuter gender.

- |     |    |                  |             |
|-----|----|------------------|-------------|
| (5) | a. | <i>de boom</i>   | ‘the tree’  |
|     | b. | <i>de rivier</i> | ‘the river’ |

- |     |    |                  |             |
|-----|----|------------------|-------------|
| (6) | a. | <i>het hart</i>  | ‘the heart’ |
|     | b. | <i>het paard</i> | ‘the horse’ |

In indefinite and in plural contexts, the grammatical gender in determiners is neutralized, as in (7) and (8) respectively. Note that the definite determiner in the plural is the same as the definite determiner for the common nouns, namely *de* (for more details about neutralization of Dutch grammatical gender in specific contexts, refer to Don and Blom, 2006).

- |     |                             |
|-----|-----------------------------|
| (7) | <i>een paard/een boom</i>   |
|     | a horse [NEUT]/a tree [COM] |

- |     |                                   |
|-----|-----------------------------------|
| (8) | <i>de paarden/de bomen</i>        |
|     | the horses [NEUT]/the trees [COM] |

As illustrated in Table 3.3, the *-e* suffix of the attributive adjective is obligatorily present when it is used with with nouns from the *de*-group (the common gender nouns). However, in the case of the *het*-group, nouns (the neuter gender nouns), the *-e* suffix is absent in indefinite singular NP's. In the remaining cases within the *het*-group, the *-e* suffix is obligatorily present.

**Table 3.3: The role of grammatical gender in Dutch attributive adjectival inflection**

	SG		PL	
	<i>de</i> -nouns	<i>het</i> -nouns	<i>de</i> -nouns	<i>het</i> -nouns
DEF	<i>de</i>	<i>het</i>	<i>de</i>	<i>de</i>
	<i>oude</i> / <i>*oud boom</i>	<i>oude</i> / <i>*oud paard</i>	<i>oude</i> / <i>*oud bomen</i>	<i>oude</i> / <i>*oud paarden</i>
	‘the old tree’	‘the old horse’	‘the old trees’	‘the old horses’
INDEF	<i>een</i>	<i>een</i>		
	<i>oude</i> / <i>*oud boom</i>	<i>*oude</i> / <i>oud paard</i>	<i>oude</i> / <i>*oud bomen</i>	<i>oude</i> / <i>*oud paarden</i>
	‘an old tree’	‘an old horse’	‘old trees’	‘old horses’

The gender of Dutch *root* nouns is, in most cases, unpredictable (Haeseryn, Romijn, Geerts, de Rooij and van den Toorn, 1997). That is, apart from a few semantic classes such as, names of flowers, trees, seasons (which all have common gender) and metals, languages, sports (which all have neuter gender), one cannot predict gender on the basis of the noun’s meaning. There also exist no phonological gender categories for root nouns in Dutch (but see Trommelen and Zonneveld, 1986; Van Beurden and Nijen - Twilhaar, 1990). Derivational affixes, however, do lead to predictable gender: Nominalizations with the suffix *-heid* (*de onwetendheid* ‘the ignorance’), *-ing* (*de herhaling* ‘the repetition’), *-teit* (*de identiteit* ‘the identity’), for example, fall in the class of common gender nouns, and nominalizations with the prefixes *ge-* or *ver-* are included in the class of neuter gender nouns (*het gedachte* ‘the thought’, *het verdriet* ‘the sadness’). Diminutive nouns are uniformly neuter gender, even if the non-diminutive root noun is common gender. The diminutive form is exemplified in (9).

- (9) a. *het boompje* ‘the little tree’  
 b. *het paardje* ‘the little horse’

Based on the observation that, in Dutch, a noun's grammatical gender is essentially arbitrary (Deutsch and Wijnen, 1985; Haeseryn et al., 1997; Van Berkum, 1996), we can assume that grammatical gender is a lexically-specified property of nouns. This means that gender is part of a noun's lexical entry as opposed to being computed online (Harris, 1991; Kester, 1996; Vigliocco and Zilli, 1999; Vosse and Kempen, 2000).

To this point, I have provided a description of the Dutch inflection system as it appears in any Standard Dutch grammar (e.g. Haeseryn et al., 1997; Broekhuis, 1999 for adjectival inflection). The view which I will investigate here - that acquisition of inflection is a mapping process between morphological forms and underlying morphosyntactic features - requires that I specify the form-feature correspondence. This is necessary in order to formulate predictions about acquisition of Dutch inflection based on various saliency factors.

The scheme in (10) presents a slightly adapted version of the form-feature specification in Dutch verbal and adjectival inflection proposed by Blom, Poliřenská and Weerman (2006). The issue about whether or not negative features are, in fact, unspecified and should or should not be reformulated or left out is not relevant for the purposes of this thesis. Note that the suffixes (left-hand side of the arrow) in (10) are given in their orthographic form. In Standard Dutch, the /en/ form in the verbal paradigm can either be pronounced as [ɛn] or simply as [ɛ].

#### (10) a. Form-feature specification for verbs

/t/	↔	[+FIN; -SP; -PL]
/en/	↔	[+FIN; +PL]
/ø/	↔	[+FIN]
/en/	↔	[-FIN]

#### b. Form-feature specification for adjectives

/ø/	↔	[+ATTR; -DEF; +NEUT; -PL]
/e/	↔	[+ATTR]
/ø/	↔	[-ATTR]

Blom et al.'s form-feature specification in (10) is based on the assumptions of Distributed Morphology (henceforth: DM) (Halle and Marantz, 1993). DM is

often referred to as ‘late insertion theory’. This means that, in DM, syntactic categories are viewed as purely abstract, having no phonological content. Only after syntax, is the lexicon searched for a phonological form that matches the feature(s), after which it is inserted in a process called Spell-out. The insertion of affixes is viewed as a competition, in which the most specified affix, i.e. the affix with most morphosyntactic features, wins out, provided that its features are compatible with the morphosyntactic environment. If, for whatever reason, the most specific affix cannot be inserted, the next specific affix comes into play and so on, until the last affix, often referred to as ‘the default’ will be inserted. This operating principle is a result of the interplay between the Subset Principle which says that “the features of the inserted vocabulary item must be equal to or a subset of the features in the syntactic slot” (Halle, 1997) and the Elsewhere Principle (Kiparsky, 1973, 1982), which blocks selection of an underspecified morphological form and gives precedence to a more specific rule over a more general one.

When applied to (10), the interaction of the Subset Principle and the Elsewhere Principle prevents insertion of the  $-\emptyset$  suffix if the subject is a non-speaker, or insertion of the  $-e$  suffix, if the noun is singular and neuter and the determiner indefinite. Conversely, the  $-\emptyset$  suffix will appear if the subject is 1<sup>st</sup> person singular, whereas the  $-e$  suffix will be inserted in any attributive contexts but the one for the combination: indefinite, neuter and singular.

Note that both the adjectival paradigm and the verbal paradigm in (10) are considered to have a form that is less specific, or, a default (in terms of DM: a form that is underspecified) with respect to one or more other forms. In the Dutch attributive adjectival paradigm, this is the adjective with the  $-e$  suffix, which is considered to be more general than the  $-\emptyset$  suffix, that only appears only in very specific circumstances. Although the way this is formulated in (10b) is framework-specific, the idea behind this claim is uncontroversial (Broekhuis 1999).

The form-feature specification in (10) is dependent on assumptions which are based on generalizations about the Dutch system. The first assumption is that the homophony of the  $-\emptyset$  suffix in attributive and non-attributive position in Dutch is coincidental. This view is, in fact, defended by any standard grammar of Dutch (see for instance Broekhuis 1999). In (10b), it is expressed by the fact that the homonymous  $-\emptyset$  suffixes have a distinct feature representation.

Similar to adjectival inflection, the standard assumption is that the homophony of the  $-en$  suffix in finite and non-finite position is accidental, which, in (10b), is expressed by a distinct feature representation (Haeseryn et al.,

1997). It should be pointed out, however, that this claim is not accepted by all. In line with the standard assumption, Aalberse (2009) argues that the non-finite *-en* and the finite *-en* have distinct feature representations. In support of this position, Aalberse presents evidence from Dutch dialects where the finite plural form differs from the non-finite form. An alternative view avoids the homophony of the *-en* suffix by assuming that there is only one form-feature specification with respect to the *-en* suffix, namely that the *-en* suffix is considered underspecified (Wexler, Schaeffer and Bol, 2004; Bennis and MacLean, 2006).

Since, cross-linguistically, the plural (and not the singular) tends to be the marked form (Harley and Ritter, 2002), it is no surprise that, within the verbal paradigm in (10a), the plural is more specified than the singular. This makes sense from a cognitive perspective, but is also visible in the morphology: Very often, singular versus plural runs parallel to absence or presence of an affix. In Dutch verbal inflection, this can be observed in the past tense, where the suffix *-en* follows the past tense marking in the plural, whereas there is only past tense marking in the singular.

It is less obvious that, from the two remaining finite verb forms, the *-ø* suffix is considered less specified. A feature system in which the suffix *-t* comes out as a less specified form, can easily be imagined (see Koeneman, 2000). The reason why the *-ø* suffix in (10a) is considered unspecified is that the *-ø* suffix is inserted in special position in the target system, even if the subject is not 1<sup>st</sup> person. This holds for the inversion context in 2<sup>nd</sup> person singular, as illustrated in (11), which can be easily be accounted for on the assumption that the *-ø* suffix is the one less specified (the default) (Ackema and Neeleman, 2003).

- (11) *Daar zie -ø je Barbora.*  
 There see – 2SG-INV you Barbora.  
 ‘There you see Barbora.’

The goal of this section was to provide a description of the form-feature specification and to motivate how it was established. Whereas the description of the adjectival paradigm is uncontroversial, the assumptions about the verbal paradigm are a matter of an ongoing debate. In this respect, two particular issues are unclear: (1) the feature representation of *-en*; and (2) the default form within the finite paradigm. As explained earlier within the framework of DM, the Subset principle and the Elsewhere principle pose immediate restrictions on the acquisition of inflection. They predict that children might use underspecified

forms in an inappropriate context if they lack the more specific ones. Under the assumption that such principles are innate, I conclude that they are operative from early on. The crucial implication is that, when the same morpheme is incorrectly used in various slots of the paradigm, it is assumed that this morpheme is underspecified for certain features. As soon as specified alternatives are acquired, no substitution errors should be found in children's output. It is here, I believe, that the findings obtained in the present study can contribute to the discussion regarding the form–feature specification of Dutch verbal paradigm: If I find that children overuse the *-en* suffix in the singular, I can conclude that *-en* is the underspecified form and that there is no need to assume that there is homophony with two separate feature representations. Similarly, overuse of either the *-t* or the *-∅* suffix could be an indication of which suffix is underspecified and hence, used as a default.

## 3.2 Method for determining salience

In the final section of Chapter 2, I argued that an accumulation of factors, rather than a single factor, is likely to influence the salience of a morpheme. In line with this claim, this section presents a procedure that attempts to measure the cumulative effects of salience factors within and between paradigms. To my knowledge, so far, the only proposal for calculating cumulative effects comes from Goldschneider and DeKeyser (2005). As is the case in the present study, Goldschneider and DeKeyser investigated whether a combination of several factors can account for variation in acquisition order. However, whereas the present study focuses on the role of salience in form–feature correspondence in inflectional Dutch paradigms, Goldschneider and DeKeyser looked at common English morphemes. Based on available data from existing studies, Goldschneider and DeKeyser analyzed a wide variety of morphemes: bound morphemes such as present progressive *-ing*, past tense *-ed*, 3<sup>rd</sup> person singular *-s*, possessive *-s*, as well as free morphemes such as definite and indefinite articles. Given that the differences in the choice of the specific subset of morphemes lead to different sets of features, I simply cannot apply Goldschneider and DeKeyser's method to examine the complex issue of the role of salience in children's acquisition of (agreement) inflection.

The method which I will adhere to is based on the assumption that all salience factors have equal weight. This implies that, during acquisition, children do not consider some salience factors more relevant than others. Instead, they rely on all factors and use them equally as cues to learn inflection. Based on this

assumption, the analysis proceeds in two steps: First, following the predictions presented in Chapter 2, and repeated in (12) – (16), I rank the form-feature pairs in (10a) and (10b) from the most salient to the least salient.

- (12) *Phonological salience*: Phonologically salient morphemes will be acquired earlier than less phonologically salient morphemes: It is expected that children acquire morphemes that contain full vowels prior to morphemes that contain reduced vowels. The acquisition of morphemes containing no vowel is expected to follow the acquisition of morphemes containing a full or reduced vowel. Zero morphemes are expected to be acquired last.
- (13) *Positional salience*: Morphemes placed in the final position of an utterance (sentence level) or of an extracted speech unit (word level) should be acquired earlier than morphemes placed in the front or middle-position.
- (14) *Feature salience*: Morphosyntactic features that correspond to natural classes with direct referents in the world are considered conceptually salient and, hence, expected to be expressed earlier than morphosyntactic features without these properties.
- (15) *Feature complexity*: An inflectional morpheme is considered salient when it encodes fewer morphosyntactic features: The fewer features a morpheme encodes, the sooner it should be acquired.
- (16) *Input frequency*: The higher the frequency of a given inflectional morpheme in the child's input the earlier its acquisition.

The ranking proceeds top-down, which means that the most salient form-feature pair occupies the highest place in the hierarchy and thus, receives the highest possible score. The form-feature pair which is placed at a lower position will receive a score that is one point lower. This procedure continues until the lowest possible score is given. Sometimes form-feature pairs will be equally salient with respect to a certain factor. For example, if all morphemes in a paradigm contain an open vowel, I will assume that they have the same level of phonological salience. In these cases, the form-feature pairs are ranked at the same level in the hierarchy and will receive the same score.

The range of the scales depends on how many form-feature pairs a paradigm contains. For example, the verbal paradigm in (10a) contains four

pairs whereas the adjectival paradigm in (10b) contains three pairs. Hence, in the verbal paradigm, ‘4’ will be assigned to the most salient pairs, whereas ‘3’ will be assigned to the most salient pairs in the adjectival paradigm. By ranking the form-feature pairs according to their salience, each form-feature pair receives five scores (i.e. one from each factor). For between-paradigm comparisons, the same procedure is applied to complete paradigms.

Given that my goal is to assess the cumulative effects of salience factors in (12) – (16), the next step is to add up the five ranks from the first part of the analysis in order to obtain a final score for specific form-feature pairs or paradigms. The idea behind this procedure is that a form-feature pair or a paradigm with the highest score is considered the most salient and hence, expected to be acquired first. In contrast, I predict that the form-feature pair or paradigm with the lowest score will be acquired last.

My method represents one possible way to analyze the cumulative effects of various salience factors. In the following, I will discuss what my method can show, and which aspects should be taken with caution. One critical assumption that I make is that all salience factors have equal weight. This assumption is not problematic when ranking across salience factors is consistently high or consistently low. For example, a form-feature pair A, which scores highly on multiple factors is assumed to hold a high position in the hierarchy, and is expected to be acquired early. In contrast, the acquisition of form-feature pair B, with consistently low ranks across factors is expected to emerge later. The consistencies of high or low salience predict robust patterns in the acquisition of inflection. This means that a form-feature pair with a high salience should be acquired considerably earlier than a form-feature pair with a low salience.

But what if form-feature pairs are ranked inconsistently across various factors? Let us assume that a form-feature pair C is ranked high on phonological salience and input frequency, but low on positional salience and neither high nor low on feature salience and feature complexity. Let us further assume that form-feature pair D is ranked high on positional salience and feature salience, but low on phonological salience and neither high nor low on input frequency and feature complexity. After the ranking scores have been summed, the level of salience for C and D turns out to be the equal. In this case, the method predicts that C and D will be acquired around the same time. It should be noted that, in this respect, my method is explorative. Therefore, if the predictions are not borne out, one should not assume that salience does not play a role in acquisition of inflection. Instead, it will be necessary to reconsider the initial assumption. It could be, for example that some factors actually have more



weight than others. If the observations are not compatible with my predictions, I will evaluate the predictions within individual factors. Emergent patterns should give me an idea about the true weight of factors, which can be tested in further empirical studies. For example, it turns out that although I predicted that there would be no variation with respect to C and D, I might observe that children are significantly more accurate producing D than producing C. By evaluating the predictions within factors, I may find that my observations are compatible with prediction within, for instance, feature salience and/or input frequency suggesting that these factors have more weight than phonological salience, feature complexity and positional salience.

In the three sections that follow, I will apply the described method in order to obtain information about salience level within and across Dutch paradigms. Sections 3.3 and 3.4 focus on verbal and adjectival inflection, respectively. Section 3.5 presents the cross-paradigmatic comparison.

### 3.3 Salience in verbal inflection

The goal of this section is to determine the level of salience for the form-feature pairs presented in (10a), repeated here in (17).

(17)	Form-feature pairs for verbs		
/t/	↔	[+FIN; -SP; -PL]	
/en/	↔	[+FIN; +PL]	
/ø/	↔	[+FIN]	
/en/	↔	[-FIN]	

#### 3.3.1 Salience within factors

##### *Phonological salience*

Recall from Table 3.1 that the Dutch verbal paradigm contains three phonologically distinct suffixes: the reduced vowel suffix *-en*, the consonant suffix *-t* and the *-ø* suffix. The scale presented in Chapter 2 (repeated in [18]) determines the acquisition order of phonological properties of inflectional morphemes: Morphemes containing full vowels are, phonologically, easiest, while zero morphemes are most difficult to learn.

(18) full vowel > reduced vowel > no vowel > zero morpheme

Based on the scale in (18), the Dutch verbal suffixes can be ranked in the following way: The *-en* suffix containing a reduced vowel is phonologically more salient than the *-t* suffix containing no vowel. The  $-\emptyset$  suffix is non-salient. The hierarchy is schematized in (19).

(19)  $-en [-\text{FIN}] = -en [+ \text{FIN}; + \text{PL}] > -t [+ \text{FIN}; - \text{SP}; - \text{PL}] > -\emptyset [+ \text{FIN}]$

Note that both the homonymous non-finite *-en* and finite *-en* occupy the highest position in the hierarchy. This is because phonological salience does not make feature distinction because it only provides cues about the language's surface structure.

#### *Positional salience*

The Dutch verbal morphemes are all final affixes. Given that affixes placed in the final position of an extracted speech unit are more salient than affixes placed in the front or middle position, positional salience does not predict salience differences in Dutch verbal suffixes. However, positional salience also predicts that elements which are placed in the final position of an utterance will be acquired earlier than elements placed in any other position. The hierarchy in (20) schematizes this ranking: Non-finite *-en* occupies the highest position in the hierarchy because it occurs in sentence-final position. The finite morphemes are all ranked on the same level because they are equal in terms of positional salience: They are all suffixes that occur in the second position in the main clauses.<sup>5</sup>

(20)  $-en [-\text{FIN}] > -t [+ \text{FIN}; - \text{SP}; - \text{PL}] = -\emptyset [+ \text{FIN}] = -en [+ \text{FIN}; + \text{PL}]$

#### *Feature salience*

In line with the conceptual hierarchy for acquisition of morphosyntactic features proposed by Harley and Ritter (2002) (and summarized in Chapter 2, Section 2.3), I derive the following predictions: (i) morphemes that mark [-PLURAL] precede morphemes that mark [+PLURAL], (ii) morphemes associated with [ $\pm$ SPEAKER; -ADDRESSEE] precede morphemes that mark [+ADDRESSEE].

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<sup>5</sup> Although finite verbs do occur in final position in subordinate clauses (Section 3.1) their predominant occurrence in the second (or fronted) position as opposed to non-finite verbs is indisputable.

Following these predictions Dutch children are expected to start out with forms which are associated with the feature contrast [ $\pm$ SPEAKER] and the feature [-PLURAL]. More specifically, feature salience predicts that Dutch children start out with either the  $-t$  suffix or with the  $-\emptyset$  suffix. The finite  $-en$  is expected to emerge later in the development. Note that Harley and Ritter's hierarchy does not address the finiteness feature. Nevertheless, it is plausible to assume that the  $-en$  [-FIN] is conceptually unmarked for finiteness. Under this assumption, the non-finite  $-en$  is considered more salient than the finite forms. The schema in (21) presents the hierarchy based on feature salience: Non-finite  $-en$  is ranked the highest. Within the set of finite form-feature pairs, the  $-\emptyset$  [+FIN] and  $-t$  [+FIN; -SP; -PL] have the same level of salience. The suffix  $-en$  [+FIN; +PL] occupies the lowest position.

$$(21) \quad -en \text{ [-FIN]} > -\emptyset \text{ [+FIN]} = -t \text{ [+FIN; -SP; -PL]} = > -en \text{ [+FIN; +PL]}$$

#### *Feature complexity*

According to (17), the Dutch verbal paradigm belongs to the fusional type, since some morphemes are associated with a bundle of features. Recall from Chapter 2, that, within a fusional paradigm, children need not immediately identify the 'correct' features and/or feature combinations. Based on morphological contrasts provided in the input, children will continue adding features until the number of features and their combinations are in accordance with the adult system. Feature complexity assumes that, within a morphological set (such as in [17]), children's attention will first be drawn to morphemes which correspond to a single feature. Dutch children will thus, start expressing the contrast between [-FINITE] and [+FINITE] morphemes. For a set of morphemes which share the same feature, i.e. [+FINITE], feature complexity implies that the form which encodes the fewest features is the most salient. This predicts that the  $-\emptyset$  suffix associated with one single feature is the most salient, followed by the  $-en$  suffix associated with a bundle of two features. The  $-t$  suffix is considered the least salient since it encodes a combination of three features. The ranking based on feature complexity is schematized in (22):

$$(22) \quad -en \text{ [-FIN]} = -\emptyset \text{ [+FIN]} > -en \text{ [+FIN; +PL]} > -t \text{ [+FIN; -SP; -PL]}$$

#### *Input frequency*

Studies that investigated input frequency of Dutch inflectional forms focused predominantly on the non-finite/finite distinction (Klein, 1974; Wijnen et al.,

2001). The observations made in these studies show that non-finite verbs were more frequent than finite verbs with respect to type counts but more or less equal with respect to token counts. To date, there has been little research on input frequencies in finite verbs. Blom (p.c.) carried out a pilot study, in which she analyzed parental input to two Dutch children from the Groningen corpus (Bol, 1996) available via CHILDES (MacWhinney, 2000). Blom found that, within the paradigm for the regular lexical verbs, the *-t* morpheme representing 2SG and 3SG occurred far more often than the other finite morphemes with respect to both token and type counts. Blom's finding is consistent with the input study on Puerto-Rican Spanish, which also reported 3SG as the most frequent form (Bybee and Brewer, 1980). With regard to the other morphemes, the pattern is less clear. On the one hand, the token counts indicated that the *-en* was more frequent than the *-∅*. However, on the other hand, the type counts were more or less equal. Given that type frequencies are likely to be more relevant with respect to the productive use of inflection (Clark, 1993), I will consider the non-finite *-en* to be more salient than finite morphemes and the finite *-en* and the *-∅* to have equal salience. In (23), I schematize the hierarchical organization based on the available input frequency data.

$$(23) \quad -en [-\text{FIN}] > -t [+ \text{FIN}; -\text{SP}; -\text{PL}] > -en [+ \text{FIN}; +\text{PL}] = -\emptyset [+ \text{FIN}]$$

### 3.3.2 Salience across factors

In the previous section, I ranked the form-feature pairs from the most salient to the least salient within each factor. Following the method described in 3.2, I will now transform the rankings into scores in order to determine salience across factors. Given that Dutch verbal inflection contains four form-feature pairs, the highest score which can be assigned, is '4'. Four represents the most salient pair, which occupies the highest position in the hierarchy within a specific factor. Table 3.4 provides an overview of the form-feature pairs and the scores that they received for each salience factor. The last column lists the sums yielded by the five factors.

**Table 3.4: Overview of scores assigned within each salience factor in Dutch verbal inflection.**

Form – Feature pair	Phonological salience	Positional salience	Feature salience	Feature complexity	Input frequency	SUM
<i>-t</i> [+FIN;-PL;-SP]	3	3	3	2	3	14
<i>-en</i> [+FIN;+PL]	4	3	2	3	2	14
<i>-∅</i> [+FIN]	2	3	3	4	2	14
<i>-en</i> [-FIN]	4	4	4	4	4	20

Crucially, the sums in the last column of Table 3.4 indicate the levels of salience in Dutch verbal inflection. According to my analysis, the most salient form-feature pair is *-en* [-FIN], since it received the highest score. As can be inferred from Table 3.4 *-en* [-FIN] was ranked the highest within each salience factor, which, not surprisingly, leads to its high overall salience. Interestingly, the form-feature pairs corresponding to finite inflection all received the same score. According to the procedure, the Dutch finite morphemes are all equally salient and are thus, expected to be acquired around the same time. Given the results in Table 3.4 I predict that in Dutch verbal inflection, the non-finite *-en* is acquired first, followed by the set of finite morphemes.

### 3.4 Salience in adjectival inflection

The aim of this section is to determine the level of salience for the form-feature pairs in the adjectival paradigm presented in (10b), repeated here in (24).

(24) **Form-feature pairs for adjectives**

/ø/	↔	[+ATTR; -DEF; +NEUT; -PL]
/e/	↔	[+ATTR]
/o/	↔	[-ATTR]

### 3.4.1 Salience within factors

#### *Phonological salience*

The Dutch adjectival paradigm contains two phonologically distinct suffixes: The reduced vowel suffix  $-e$  and the  $-\emptyset$  suffix. According to the phonological salience scale presented in 2.1, and repeated in (25), the  $-e$  suffix containing a reduced vowel is expected to be in place earlier than the  $-\emptyset$  suffix.

(25) full vowel > reduced vowel > no vowel > zero morpheme

The scheme in (26) presents the ranking of the form-feature pairs on the basis of the scale in (25). The  $-e$  suffix is ranked the highest, followed by the  $-\emptyset$  suffix. With regard to phonological salience, the feature distinction between the non-attributive  $-\emptyset$  and the attributive  $-\emptyset$  is irrelevant because the cues provided by phonological salience are limited to spell-out.

(26)  $-e$  [+ATTR] >  $-\emptyset$  [-ATTR] =  $-\emptyset$  [+ATTR; -DEF; +NEUT; -PL]

#### *Positional salience*

The Dutch adjectival morphemes are final affixes. Given the assumption that affixes placed in the final position of an extracted speech unit should be acquired earlier than affixes placed in the front or in the middle position, I do not expect differences in acquisition of Dutch adjectival morphemes. However, positional salience also predicts that elements placed in the sentence final position are more salient than elements placed in any other position. In line with this prediction, the non-attributive  $-\emptyset$  suffix is ranked the highest, as it never precedes the head noun and occurs frequently in final position. The attributive morphemes have the same level of positional salience: They are both suffixes and they both appear in the middle of an utterance. The scheme in (27) gives the ranking based on positional salience.

(27)  $-\emptyset$  [-ATTR] >  $-e$  [+ATTR] =  $-\emptyset$  [+ATTR; -DEF; +NEUT; -PL]

#### *Feature salience*

In Section 3.1, I mentioned that grammatical gender plays a fundamental role in the acquisition of Dutch adjectival paradigm. According to feature salience, discussed in 2.3, grammatical GENDER is a low-salient feature and, hence, more likely than other features, such as NUMBER to be absent from children's early

paradigms. With respect to the non-attributive/attributive contrast, I will not assume a relative ordering, since there is no reason to assume that the feature [-ATTR] is ordered above [+ATTR], or vice versa. Feature salience suggests the ranking of adjectival inflection as indicated in (28).

$$(28) \quad -\emptyset [-ATTR] = -e [+ATTR] > -\emptyset [+ATTR; -DEF; +NEUT; -PL]$$

*Feature complexity*

The form-feature analysis in (24) shows that the Dutch adjectival paradigm has fusional properties: The attributive  $-\emptyset$  morpheme must be mapped to a combination of four features [+ATTR; -PL; -DEF; +NEUT]. Earlier, I explained the principles of feature complexity and how they relate to fusional paradigms. Under the assumption that children start with the most distinct form-feature contrast, I assume that the morphosyntactic distinction between the [-ATTR]  $-\emptyset$  suffix and the [+ATTR]  $-e$  suffix is the most salient for Dutch children. Within the set of morphemes with the shared feature [+ATTR] the  $-e$  suffix is more salient than the  $-\emptyset$  suffix, which is associated with a bundle of four features. The ranking based on principles of feature complexity is given in (29):

$$(29) \quad -\emptyset [-ATTR] = -e [+ATTR] > -\emptyset [+ATTR; -DEF; +NEUT; -PL]$$

*Input frequency*

Blom, Polišenská and Puccini (submitted) analyzed input frequencies based on data from the Groningen corpus (Bol, 1996), which is available via CHILDES (MacWhinney, 2000). Their data consists of 49 transcribed sessions from six Dutch children. Based on the assumption that Dutch children make a morphosyntactic distinction between non-attributive and attributive position, Blom et al. found that, based on both type and token frequency counts, non-attributive  $-\emptyset$  significantly outnumbers the attributive  $-\emptyset$  and the attributive  $-e$ . When the input frequency focused on adjectives in attributive position, the type counts revealed that Dutch children hear a greater variety of adjectives with the  $-e$  morpheme than adjectives ending with the  $-\emptyset$  suffix. In contrast, the token counts did not significantly differ for the attributive adjectives. The scheme in (30) presents the ranking of salience for input frequency. This ranking works under the assumption that type frequency is more relevant than token frequency for children's learning of inflection (Clark, 1993).

$$(30) \quad -\emptyset [-ATTR] > -e [+ATTR] > -\emptyset [+ATTR; -DEF; +NEUT; -PL]$$

### 3.4.2 Salience across factors

I analyzed the level of salience by ranking the form-feature pairs in (24) from most salient to least salient within each salience factor. In order to determine salience across factors, it is first necessary to transform the ranks into scores, as described in 3.2. Given that adjectival inflection consists of three form-feature pairs, the highest score, which can be assigned within a factor is '3'. A '3' represents the most salient pair, which occupies the highest position in the hierarchy within a specific factor. Table 3.5 gives an overview of the scores, which were assigned to each form-feature pair. In the last column the sums of the scores are listed.

**Table 3.5: Overview of scores assigned within each salience factor in Dutch adjectival inflection.**

Form – Feature pair	Phonological salience	Positional salience	Feature salience	Feature complexity	Input frequency	SUM
$-\emptyset$ [+ATTR; -DEF; +NEUT; -PL]	2	2	2	2	1	9
$-e$ [+ATTR]	3	2	3	3	2	13
$-\emptyset$ [-ATTR]	2	3	3	3	3	14

The summary in Table 3.5 suggests the following salience levels within the adjectival inflection: The non-attributive  $-\emptyset$  comes out as the most salient suffix closely followed by the attributive  $-e$ . The attributive  $-\emptyset$  is the least salient suffix. According to this ordering, I can formulate the following prediction about children's acquisition of Dutch adjectival inflection: the non-attributive  $-\emptyset$  is expected to be acquired first, followed by the attributive  $-e$ . Finally the attributive  $-\emptyset$  is expected to be acquired relatively late.



### 3.5 Salience across paradigms

A comparison between paradigms revealed that the verbal paradigm and adjectival paradigm are alike with respect to phonological and positional salience: None of the paradigms contain an open vowel morpheme, while both paradigms contain reduced vowel morphemes and zero morphemes. In addition, all inflectional morphemes are marked by suffixes and none of the suffixes are stressed. Finally, both paradigms have an inflectional form that occurs most often in utterance-final position: the non-finite *-en* morpheme in the verbal paradigm and the non-attributive *-∅* morpheme in the adjectival paradigm.

With respect to feature salience and feature complexity, however, the paradigms differ. It appears that [ $\pm$ NEUTER] makes the adjectival paradigm less salient than the verbal paradigm because the verbal paradigm contains features that refer directly to concepts in the world. Moreover, following the form-feature specification in (10), the adjectival paradigm is more complex in that it can combine up to four features whereas the verbal paradigm combines a maximum of three features.<sup>6</sup>

With regard to input frequency, the difference between paradigms is not as straightforward. However, it is reasonable to assume that verbs occur more frequently than adjectives since they are usually obligatory in a sentence, whereas adjectives are not. Based on this assumption, one would argue that input frequency should have a more facilitating effect on the acquisition of verbal inflection than it would on the acquisition of adjectival inflection.

In conclusion, the comparison of paradigms shows that the verbal paradigm is more salient than the adjectival paradigm. In particular, feature salience and feature complexity contribute to a higher level of salience for the verbal paradigm. Based on the assumption that the verbal paradigm is more salient than the adjectival paradigm, I predict that it will be acquired earlier.

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<sup>6</sup>One could argue that adding a tense feature [ $\pm$ PAST] makes the verbal paradigm more complex. Consequently, this would result in an identical feature complexity between paradigms. In this respect it is important to realize that [ $\pm$ FIN] is a feature associated with tense. Alternatively, we could have posited the feature [ $\pm$ PAST] (e.g. Wexler et al., 2004) and left the non-finite form unspecified. This form-feature specification would not alter either the feature complexity within the verbal paradigm or the feature complexity across the verbal and the adjectival paradigm. Note that the latter specification may predict the occurrence of non-finite *-en* in finite position; this type of error hardly ever occurs, however (e.g. Jordens, 1990; Wijnen, 1995 a,b; Blom, 2008).

### 3.6 Empirical findings: Where are we now?

In the previous sections, I formulated predictions about salience within and across paradigms. The aim of this section is to evaluate these predictions on the basis of established empirical findings. In doing so, I will offer an overview of which issues have already been addressed and which issues still need to be explored.

#### 3.6.1 Verbal inflection

From the studies carried out by Van Ginneken (1917), Verhulst-Schlichting (1985), De Haan (1986), Jordens (1990), Bol (1995), Wijnen (1995 a, b), Blom (2003) we know that very young Dutch children (around 24 months) make very few errors with respect to the position of finite and nonfinite verbs. For example, they correctly place the non-finite verb in the final position (as in [31a]) and the finite verb in the second position in matrix sentences (as in [31b]) (examples are taken from Gillis, 2003).

- |         |                                |               |
|---------|--------------------------------|---------------|
| (31) a. | <i>kap aandoen</i>             | (Jolien, 1;8) |
|         | hood put on -INF               |               |
|         | ‘put on a hood’                |               |
| b.      | <i>ik wil ook een trui aan</i> | (Jolien, 2;2) |
|         | I want -FIN also a sweater on  |               |
|         | ‘I also want a sweater on’     |               |

However, as Wijnen and Verrips (1998) and Blom (2003) point out, the term *finite* is somewhat misleading when discussing Dutch children’s early developmental stages of verbal inflection. Specifically, it is important to note that, at this stage, tense and agreement marking have not been fully mastered. Evidence in favor of this notion comes from a number of researchers who posit that agreement inflection develops gradually (e.g. De Haan, 1987; Jordens, 1990; Van Kampen, 1997; Wijnen, 1999, 2000; Blom, 2003). Studies conducted by Wijnen and Bol (1993) and Haegeman (1995) indicate that Dutch-learning children begin producing verbal inflection with non-finite forms and that finite forms emerge later. Similarly, Wijnen (2000) and Blom (2003) show that Dutch children go through three developmental stages: They start off with a stage, in which finiteness is omitted. Next, they enter a stage known as the *lexical-finiteness-*

*stage*, and only later, do they arrive at the adult-like *grammatical-finiteness stage*. On the basis of these developmental stages, I will review the empirical findings about the development of Dutch verbal inflection.

Between about 18 and 24 months, children start using two word utterances, which contain a single verb, as exemplified in (32). Most of these verbs are lexical verbs (examples are taken from Schaerlaekens and Gillis, 1987).

- (32) a. *kaate spele* [kaarten spelen] (Diederik, 2;1)  
 cards play -INF  
 ‘play cards’
- b. *jas aandoen* (Katelijjn, 2;1)  
 coat put on -INF  
 ‘put the coat on’

Although the first verbs in Dutch children’s output have two forms, the infinitive and the bare stem, there are indications that the infinitive occurs much more frequently and with more lexical variation (with many more verb types) than the bare stem (Gillis, 2003). The observation that Dutch children start out by producing infinitives and correctly place them in sentence-final position was first reported by Van Ginneken (1917) and has been confirmed in later studies by Verhulst-Schlichting (1985) De Haan, (1986), Jordens (1990), Bol (1995), Wijnen, 1995a, b, Gillis (2003) and Blom (2003) (see Wijnen and Verrips, 1998 for more detailed overview of the literature).

Early child verb productions can be analyzed as ‘root infinitives’, which are, in fact, non-finite verbs that appear in finite matrix clauses (see Blom, 2008 for an overview of relevant literature). Children like Diederik, in example (32a), seem to opt for a root infinitive exactly where an adult would use a sentence containing finite verb (see examples in (33) for adult-like utterances).

- (33) a. *ik wil met kaarten spelen*  
 I want -FIN with cards play -INF  
 ‘I want to play with cards’
- b. *ik speel met kaarten*  
 I play -FIN with cards  
 ‘I play with cards’

The lack of any syntactic or morphological expression of finiteness in the root infinitive stage suggests that the feature [ $\pm$ FINITE] does not play a role in the children's early grammar (Blom, 2008). According to Wijnen and Verrips (1998), Dutch children learn the base position of the verb before they learn anything else. Recall from Chapter 2, that Wijnen et al. (2001) show that positional salience, semantic salience and input frequency in the child's input are all factors which play an important role in the early appearance of infinitives in child Dutch. Furthermore, Klein (1974) found that Dutch mothers display a preference for SOV word order in child-addressed speech using so called 'dummy auxiliaries' in their speech.

The lexical-finiteness stage consists of two sub-stages (Wijnen, 2000; Blom, 2008). In the first substage, *the lexical-finiteness markers* emerge. These are auxiliary-like forms, such as *wil* 'want', *moet* 'have to' or *ga* 'go', that denote tense and modality (De Haan, 1987). This developmental (sub)stage is characterized by the appearance of a significant increase in number of constructions with a single verb occurring in a left-peripheral, first or second position (Verhulst-Schlichting, 1985; Bol and Kuiken, 1988; Bol, 1995). This type construction is illustrated in (34) (example is taken from Blom, 2003).

- |      |                      |             |
|------|----------------------|-------------|
| (34) | <i>wij moet ook</i>  | (Abel, 2;7) |
|      | we have to -FIN also |             |
|      | 'we have to as well' |             |

Note that in such utterances, the form of the finite verb usually corresponds with that of an adult finite equivalent. The modals, however, are still used without a non-finite verb.

Another characteristic of the first lexical-finiteness sub-stage is that children seem to demonstrate positional preferences for specific types of verbs. This non-overlap between early finite verbs and infinitival verbs has been reported in early studies of Dutch verb acquisition and confirmed in subsequent studies (De Haan, 1987; Jordens, 1990; Wijnen and Elbers, 1998; Blom, 2003; Blom, 2008). The finite verbs are mostly modals, aspectual verbs and copulas, whereas the non-finite verbs are lexical verbs that typically express activities.

In the second sub-stage, the *lexical-finiteness markers* are combined with an infinitive, which results in the appearance of periphrastic constructions such as that presented in (35) (personal diary data).

- (35) *ik wil niet slapen* (Aron, 2;6)  
 I want -FIN not sleep -INF  
 'I don't want to sleep'

This second sub-stage corresponds to the multi-word stage, during which, complex verb phrases (i.e. verb phrases including more than one verb element) emerge in the child's output. Most Dutch-speaking children are producing complex verb phrases by the time they are two and a half years old. In these constructions, one verb, the auxiliary, has finite morphology, and occurs in first or second position and the other verb, with non-finite morphology, occurs in sentence-final position just like in the adult language. The sentence-final verb can be either an infinitive as in (36a) or a past participle as in (36b). Recall that Dutch children almost never err with respect to the relation of position and finite and nonfinite morphology (examples are taken from Gillis and Schaerlaekens, 2000).

- (36) a. *ik doe ook praten* (Sarah, 2;5)  
 I do -FIN too talk -INF  
 'I talk too'

- b. *ik heb die gevonden* (Niek 3;1)  
 I have -FIN that found -PAST PARTICIPLE]  
 'I have found that'

As already mentioned in Chapter 1 De Haan (1996) carried out a longitudinal study on the spontaneous speech of children acquiring Dutch where she focused on errors with finite verbal inflection in. De Haan followed four Dutch children (see Table 3.6) and observed that number agreement errors are first present around the age of 2;5, whereas person agreement errors emerge around 2;6.

**Table 3.6: Finite verbal inflection: Data analyzed by De Haan (1996)**

Child*	Age range
Abel	1;10.30 – 3;04.01
Daan	1;08.21 – 3;03.30
Josse	2;00.21 – 3;04.17
Matthijs	1;10.13 – 3;07.02

\*The analyzed data files are from the Groningen corpus (Bol, 1996), which is available via CHILDES (MacWhinney, 2000). De Haan (1996) did not make a file selection and examined the entire corpora of the children.

De Haan observed that children's performance worsens up until a certain age. De Haan's conclusion is in line with Blom's (2003) claim, which states that, between the age of 2;4 and 2;9, Dutch children start segmenting finite verb forms, which results in an increase of errors. According to Blom, the segmentation of finite verb forms indicates the onset of the acquisition of finite inflection.

Observations made by Van Ginneken (1917), Tinbergen (1977), Extra (1977), and Jordens (1990) indicate that around three years, Dutch children begin producing *stem* + *-t* in combination with the pronoun *ik* 'I' (see [37]) (personal diary data)

- (37) a. *ik zeurt niet* (Aron, 3;5)  
 I complain not  
 'I don't complain'
- b. *kijk, ik maakt een huis* (Isabella, 3;6)  
 look, I make a house  
 'look, I'm making a house'

Based solely on these spontaneous child productions, however, it is not possible to distinguish whether children segment and analyze the *-t* as a separate suffix or whether they memorize it as a separate lexical form, i.e. *zeurt, maakt*. Errors with the irregular verb *hebben* ‘have’, however, suggest that children analyze the *-t* as a separate suffix: Instead of the target-like forms *ik heb* ‘I have’ and *hij heeft* ‘he has’, Dutch children occasionally produce the incorrect forms *ik heef* and *hij heef* (Van Ginneken, 1917; Tinbergen, 1919; De Houwer, 1990; Jordens, 1990; De Haan, 1996). Apparently, the form *heef* here is based on the 3<sup>rd</sup> person singular form *heeft* minus the final *-t*, which children have erroneously analyzed as a separate morpheme, which is the case for regular lexical verbs. Similarly, De Haan (1996) reports that children use the *-t* suffix with the modal verb *kunnen* ‘can’, sometimes producing incorrect forms such as *kant* instead of *kan*.

Another non-adult like agreement pattern has been reported by Blom (2003). Blom found that before the age of three, Dutch children overuse the *-ø* suffix in various singular contexts. Examples of some of these productions are offered in (38) and are taken from Blom’s (2003) study.

- |         |                               |                  |
|---------|-------------------------------|------------------|
| (38) a. | <i>jij bouw -ø trein</i>      | (Abel, 2;5)      |
|         | you build train               |                  |
|         | ‘you make a train’            |                  |
| b.      | <i>Mirjam klim -ø berg op</i> | (Matthijs, 2;10) |
|         | Mirjam climb mountain up      |                  |
|         | ‘Mirjam climbs up a mountain’ |                  |

In Section 3.4.1, I predicted that Dutch children first acquire the non-finite *-en* morpheme, followed by the finite morphemes. According to the studies investigating Dutch verbal morphosyntax, this prediction is correct: There is well-documented evidence which demonstrates that the non-finite *-en* morpheme predominates in early child Dutch. During the two-word stage, Dutch children correctly distinguish between finite and non-finite verbs, suggesting that the early use of *-en* corresponds to the morphosyntactic feature [-FINITE].

With respect to the acquisition of finite morphemes, I predicted that there would be no variation in child Dutch, given that the finite morphemes are all equally salient. This means that I do not expect considerable differences in the order of acquisition of the finite morphemes. Evidence from spontaneous speech data suggests that children’s agreement errors appear around two and

half years (De Haan, 1996) and are usually due to the the incorrect use of *stem* + *-t* in combination with 1SG (Van Ginneken, 1917; Tinbergen, 1919; Extra, 1977) as well as overuse of the  $-\emptyset$  suffix in 2SG and 3SG (Blom, 2003; 2007).

However, based on the evidence that is available for the inflection of finite lexical verbs, it is still debatable whether or not Dutch children have acquired finite morphemes at the age of three. First of all, the existing data-analyses collapsed various verb classes (i.e. lexical verbs, modals, copulas and auxiliaries). Given that each verb class has a specific paradigm, it is possible that the data is misrepresented. For example, when children erroneously produce the form *hij kant* ‘he can’, it may be the case that children do not make an agreement error but rather classify the modal verb *kunnen* ‘can’ as a lexical verb. As a consequence, they overuse inflectional rules from the lexical verb paradigm with modal verbs. Moreover, there is no evidence that children have acquired the full paradigm for lexical verbs by three years: before this age plural subjects and 2<sup>nd</sup> person singular subjects are rarely attested in Dutch children’s corpora (Wijnen and Verrips, 1998).

### 3.6.2 Adjectival inflection

Less research has been conducted on Dutch children’s adjectival inflection than on Dutch children’s acquisition of verbal inflection. Studies that are available report that children’s first adjectives appear between 1;0 and 1;6 as one-word sentences and are part of the child’s early lexicon (Schaerlaekens and Gillis, 1987). In the first *noun* – *adjective* combinations from 1;6 to 2;6, adjectives are used as non-attributives with omission of the copula, as illustrated in (39) (example is taken from Schaerlaekens and Gillis, 1987).

(39)	<i>boeke nat</i> [ <i>broek is nat</i> ]	(Tim, 2;7)
	pants wet	
	‘pants are wet’	

Bol and Kuiken (1988) report that children’s first adjectives appear between 2;0 and 2;6. These early adjectives usually occur without a determiner, i.e. *adjective* + *noun*, and are used quite regularly. Examples of these early adjective productions are illustrated in (40) (personal diary data).

(40) a.	<i>lekker koekje</i>	(Aron, 2;6)
	nice biscuit	
	‘nice biscuit’	



- b. *grote bal* (Alec, 2;5)  
big ball  
'big ball'

The more complex *determiner + adjective + noun* combinations appear towards children's third birthday (Bol and Kuiken, 1988; Rozendaal, 2008). The adjectives in these combinations are inflected with the *-e* suffix as in (41), regardless of the conditions in the Determiner Phrase. It seems that children initially ignore the morphosyntactic features. This is evident in the indefinite condition where, in adult Dutch the *-ø* suffix is required. This is illustrated in (41a) and (41b) (personal diary data).

- (41) a. *een blauwe stuk* (Isabella, 3;3)  
a blue piece  
'a blue piece'

- b. *een kleine huisje* (Anna, 2;10)  
a little house  
'a little house'

- c. *de grote vliegtuig* (Ties, 3;3)  
the big plane  
'the big plane'

- d. *in kleine stukjes* (Aron, 3;5)  
in small pieces  
'in small pieces'

It should be pointed out, however, that, on the basis of these examples alone, it is impossible to determine whether children lack the knowledge of attributive *-ø* in *determiner + adjective + noun* combination or whether they chose an adjectival form that agrees with the grammatical gender (neuter or common) that they assign to the noun. Studies which focused on acquisition of grammatical gender in definite determiners report a delay in the acquisition of neuter gender, which children replace with common gender (Deutsch and Wijnen, 1985; Van der Velde, 2003). This is illustrated in (41c) where the boy, Ties, overuses the definite determiner *de* with the neuter noun *vliegtuig* 'plane'. Given these observations, one could very well imagine that children assume that the nouns

they modify with the *-e* suffix have common gender and the nouns they modify with the *-o* suffix have neuter gender, which would actually be in accordance with the inflectional rule.

Weerman, Bischof and Punt (2006) were the first to address this issue in an experimental pilot study. The study investigated five groups of monolingual Dutch children (N = 20) aged three to seven years. Weerman et al. used a series of elicitation tasks in order to gauge children's knowledge of several constructions. Namely, the authors were interested in children's knowledge of: the definite/indefinite contrast in their use of determiners; the morphosyntactic distinction between attributive and non-attributive adjectives; grammatical gender in definite determiners and; knowledge of attributive adjectival inflection in various contexts. The results showed that children in the youngest group used indefinite and definite determiners adequately and that they were able to make the morphosyntactic distinction between non-attributive adjectives and attributive adjectives: they placed the non-attributive adjective in their bare form in the final position of the clause as in (42a) and they placed the attributive adjectives (which they marked by the *-e* suffix) in front of the noun as in (42b) (examples are taken from Weerman et al., 2006).

(42) a. *Deze bloem is rood.*

This flower is red -NON-ATTR

'This flower is red.'

b. *Ernie gaat naar de rode bloem.*

Ernie goes to the red -ATTR flower

'Ernie goes to the red flower.'

The data obtained from Weerman et al.'s study were consistent with the observations made on the basis of children's spontaneous speech. In particular, the study showed a general tendency for *-e* overuse in the attributive position. This tendency was strongest in the three-, four- and five-year-olds (up to 71% overuse in four-year-olds). The six-year-olds are reported to be nearly accurate in using the attributive adjectives, with only 4% overuse. In order to test whether or not the overuse of the *-e* morpheme was caused by the children incorrectly classifying neuter nouns as common, Weerman et al. tested the children's choice of the definite determiner *de* versus *het* (for information about grammatical gender see Section 3.1). It is possible that children overuse the *-e* with attributive adjectives because it always occurs so frequently with common

gender nouns. That is, the children's overuse of the  $-e$  might be, at least in part, due to the fact that they assume neuter nouns to be of common gender. This does not preclude the option that they also did not fully acquire the inflectional rule. However, a major drawback to Weerman et al.'s study is that they only tested children's knowledge of the definite determiner once. Knowing that Dutch children do not master grammatical gender until later (Deutsch and Wijnen, 1985; Van der Velde, 2003), one is surely justified in calling into question, Weerman et al.'s interpretation of the results. We simply do not know how stable children's use of grammatical gender is at this age.

In Section 3.4.2, I formulated the following predictions about the acquisition of Dutch adjectival inflection: the non-attributive  $-\emptyset$  is expected to be acquired first, followed by the attributive  $-e$  suffix, and finally the attributive  $-\emptyset$ , which is expected to be acquired relatively late. The research reviewed above provides sufficient evidence for the first prediction: A non-attributive  $-\emptyset$  morpheme is used correctly from the onset of children's production. This observation has been found in spontaneous data as well as in elicited production data from the youngest tested children. In support of the second and the third predictions, research suggests that, for attributive adjectival inflection, children acquire the  $-e$  morpheme first, which is followed by the attributive  $-\emptyset$  morpheme. Previous studies, however, do not provide sufficient insight to speculate the exact cause of children's seemingly early acquisition of the attributive  $-e$  and the late acquisition of the  $-\emptyset$  suffix in the same paradigm. As mentioned, their performance could either be attributed to a lack of knowledge about the inflectional rule, or to their incorrect attribution of gender to the nouns.

### 3.7 Research questions

I have two goals for the present study. First, I aim to test the claim that children have very early knowledge of inflection. Second, I examine the extent to which salience can explain the changes in the acquisition of inflection. Recall that maturational accounts assume that developmental changes are biologically driven. In contrast, I assume that it is possible to predict the order of acquisition of an inflectional morpheme based on its level of salience. Based on this assumption, I predict that children will first acquire the most salient morphemes/paradigms, and then the less salient ones. In Section 3.2, I described a method that was used to assess the level of salience within and

across paradigms. Based on the results of my analysis, in (43) – (45) I predict the following about the acquisition of Dutch inflection:

- (43) With respect to *verbal inflection*, the non-finite *-en* morpheme will be acquired first, followed by the set of finite morphemes. I do not expect significant differences in the order in which the finite morphemes will occur.
- (44) With respect to *adjectival inflection*, I predict that non-attributive *-∅* will be acquired first, followed by attributive *-e* suffix. The attributive *-∅* is expected to be acquired significantly later.
- (45) With respect to the *cross-paradigmatic comparison*, I predict that verbal inflection will be acquired earlier than adjectival inflection.

The empirical research, already discussed in Section 3.6, supports the predictions about the emergence of non-finite *-en* and non-attributive *-∅*, namely, that they should be acquired first. Literature also provides robust evidence that Dutch children are able to differentiate non-finite verbs from finite verbs and non-attributive adjectives from attributive adjectives from early in development. Based on these observations, I can conclude that the available data from child Dutch support the hypothesis that children first acquire the most salient form-feature pairs.

The literature, however, does not provide sufficient data to assess the other predictions. This is due, primarily, to the fact that most of the earlier investigations are based children's spontaneous speech data. In Chapter 1, I already discussed why spontaneous speech data is problematic for assessing children's knowledge of inflectional rules. As I mentioned, the analyses provided by De Haan (1996) and Weerman et al. (2006) require further examination. Although both studies provided valuable data, the information was limited in ways that prevent one from drawing firm conclusions concerning the developmental patterns about Dutch agreement inflection. For verbal finite inflection, De Haan (1996) did not look systematically into children's error rates, nor did she investigate the types of errors in children's production. Further, her research did not extend across various inflectional contexts. Lastly, De Haan's analysis collapsed various verb classes, i.e. lexical verbs, modals, auxiliaries and copula's. A thorough analysis should investigate these classes separately. With respect to attributive adjectival inflection (Weerman et al., 2006), there are also

gaps in the data which make it difficult to gain a comprehensive view about what young children actually know about adjectival inflection. In order to gain a better understanding of such, it is necessary to improve the testing procedure.

The various limitations of the previous studies show the need for further investigation. By using elicited production data that includes nonce verbs, and by testing 18- to 19-month-old's sensitivity to agreement inflection, the present study will provide more fruitful data. In addition, the present study examines accuracy-rates as well as substitution errors in contrastive inflectional contexts across various ages. Whereas previous studies focused mainly on children up until the age of four, I will investigate children's production from three to eight years. By gathering new evidence, I aim to explore children's variation in inflection by comparing inflectional suffixes within and across paradigms, and by looking into the developmental patterns with between-subject comparisons.

In sum, this research is guided by the following questions: (1) *To what extent do the data from child Dutch support the idea that children know agreement inflection from early on?* And (2) *To what extent can saliency account for the order of acquisition of inflectional morphemes in monolingual Dutch children?* In the following chapters, these questions will be addressed through various empirical investigations: Chapters 4 and 5 report on children's production and perception of finite verbal inflection, while Chapter 6 investigates their knowledge of the attributive adjectival inflection.



# 4

## Production of finite verbal inflection

This chapter presents an empirical investigation of Dutch children's acquisition of finite verbal inflection. The aim of this investigation is to address the research questions presented in Chapter 3 by analyzing elicited production data. The focus of the investigation is twofold. First, in order to test the claim that children have early knowledge of inflection, I examine the extent to which the rules for finite verbal inflection are productive in monolingual Dutch children. Second, I explore whether or not the order of acquisition of verbal forms can be accounted for by considering the degree of salience of each particular morpheme. Recall from Chapter 3 that, based on salience, one would not expect variation between the rates of acquisition for the finite morphemes. This chapter is organized as follows: In Sections 4.1 through 4.5, I provide details on the methodological design of the study. Results are presented in Section 4.6, followed by an interpretation of results in 4.7. Section 4.8 concludes the chapter.

### 4.1 Participants

In total, 46 monolingual Dutch children aged three to six years participated in the study. The children lived in the central, western part of the Netherlands and spoke the standard variety of Dutch. There are regional dialects of Dutch which show variation in their inflectional systems (Bennis and MacLean, 2006; Aalberse, 2009; MacLean, in preparation). It was therefore necessary to ensure that all children were acquiring the same variety of Dutch.

Since the aim of the study is to provide insight into Dutch children's typical development, it was necessary to exclude children with developmental problems that could influence language development. According to the children's teachers, none of the selected children had experienced any developmental

problems with cognitive skills, language skills, or socio-emotional skills. Nor, did any of the children suffer from hearing loss or vision problems. Children who had attended speech therapy were also excluded from this study.

Dutch children's productive use of inflection starts around two and half and continues to develop beyond three years (De Haan, 1996; Blom, 2003). More specifically, De Haan reports that, from two and a half years till three years, children become less accurate with their use of finite suffixes. I begin at the age where De Haan's work ended, that is, with three-year-olds. Choosing children at this age will also ensure that children are capable of participating in the elicitation tasks. Based on the findings from cross-linguistic research (Bittner et al., 2003), I assume that verbal inflection should be mastered by six years. Accordingly, this is the age at which I stop collecting data.

I used a cross-sectional design according to which children were divided into four age groups. Age is thus the independent variable, while knowledge of inflection is considered the dependent variable. Table 4.1 presents information about the number of participants in each age group, their sex, and the means and standard deviations of their age.

**Table 4.1: Information about the participants in the verbal inflection test**

AGE GROUP (YRS)	N OF PARTICIPANTS			MEAN AGE	SD AGE
	BOYS	GIRLS	TOTAL	(YR; MOS)	
3	6	6	12	3;07	0.24
4	5	7	12	4;05	0.41
5	5	7	12	5;05	0.32
6	4	6	10	6;04	0.31



In order to compose a representative sample, I selected children who came from parents with low, middle, and high socio-economic statuses (SES). In general, however, most of the children had middle to high SES backgrounds. Although SES has been reported to influence children's developing vocabulary skills (e.g. Horton-Ikard and Ellis Weismer, 2007) and their sentence length (e.g. Snow, 1999), there has been, to my knowledge, no reported influence of SES on the development of morphosyntactic agreement (e.g. Chiat, 2001).

## **4.2 Data collection**

Parents always granted consent to allow their children to participate in the study. In order to guarantee children's anonymity, all names have been changed; only information relating about age and gender is documented. The data were collected in a controlled experimental setting. The children were tested in a separate room at their local school or in their day care centre. The testing sessions were audio-recorded by a digital recorder (Olympus HD-10) that was equipped by a microphone and placed in the middle of the table. Children's responses were orthographically transcribed following the spelling conventions of Standard Dutch (see Appendix 4.1 for a scoring sheet). The transcriber involved in this project was a graduate student who received detailed instruction as described in coding book FlexiT (Blom, Orgassa and Poliřenská, 2008). The transcriber was not related in any way with any of the participants. In order to assess reliability, 20% of the recordings (randomly selected) were transcribed by a second transcriber. Agreement was very high, at 93%.

## **4.3 Test conditions and test items**

It was also crucial to collect information about children's knowledge of the complete set of paradigmatic contrasts. This was achieved by testing different forms individually. In total, I elicited five forms, all of which are listed in Table 4.2.

Table 4.2: An overview of the test conditions

TEST CONDITION	STEM + SUFFIX	EXAMPLE (LEZEN 'TO READ')
1SG	STEM + $\emptyset$	<i>Ik lees</i>
2SG-INV	STEM + $\emptyset$	<i>Lees jij</i>
2SG	STEM + <i>t</i>	<i>Jij leest</i>
3SG	STEM + <i>t</i>	<i>Hij leest</i>
3PL	STEM + <i>en</i>	<i>Zij lezen</i>

I tested children's knowledge of finite verb inflection in non-inverted order (subject-verb) in 1SG, 2SG, 3SG and 3PL. For the 2SG condition, I also tested the inverted order (verb-subject). This decision was made because the Dutch verbal paradigm includes a contrast in 2SG between the non-inverted and the inverted order. Namely, the inverted finite verb in 2SG is bare whereas the non-inverted finite verb in 2SG is marked by the *-t* suffix. Examples of this contrast are provided in (1a) and (1b).

(1) a. *lees jij*  
 read -2SG-INV you  
 'you read'

b. *jij leest*  
 you read -2SG  
 'you read'

All conditions were tested with both existing and nonce verbs. The inclusion of nonce verbs is essential because it provides information on how productive children really are in applying inflectional rules (see also Chapter 1). Children's correct use of a correct existing finite verb can either reflect their knowledge of

inflectional rules, or it can reflect their storage of unanalyzed forms (Berko, 1958; Peters, 1982; Pinker, 1999; Tomasello, 2003). If children use inflection productively, we expect good performance with nonce verbs since nonce verbs cannot already be stored on the basis of input data. The main criterion for the choice of the nonce verbs was that they would be unknown to children.

In order to ensure that children were actually familiar with the existing verbs, test words were selected from the standardized vocabulary list for Dutch children under the age of three (N-CDI, Zink and Lejaegere, 2002). The existing verbs denoted actions that could be easily modeled by both the researcher and the child. Table 4.3 presents the test items.

**Table 4.3: An overview of the items in the verbal inflection test**

EXISTING VERBS	NONCE VERBS
<i>Tekenen</i> ‘to draw’	<i>Pieren</i>
<i>Drinken</i> ‘to drink’	<i>Spollen</i>

On the basis of the five conditions and four test items, a maximum of 20 responses per participant were possible. A number of children were tested with an earlier version of the test that contained three existing items and three nonce items. This, of course, resulted in a maximum of 30 responses per participant. In total, 17 children were tested with the earlier version: five three-year-olds, two five-year-olds, and ten six-year-olds. The additional nonce item was *kluiken* ‘to kluik’ and the additional existing item was *trekken* ‘to pull’. The reason to (slightly) adapt the test during the study and limit the number of test items to four was that elicitation of six verbs turned out to be too demanding on younger children’s attention abilities. Consequently, during the testing, children would indicate that they no longer wanted to take part in the session, often giving answers such as *ik weet het niet* ‘I don’t know’. Given that the main goal of the test was to elicit various finite morphemes, I preferred that the child finish all tasks, and produced the complete set of finite morphemes with less test items. Table 4.4 provides an overview of the maximum number of elicited

responses per group, taking into consideration, the different number of test items across subjects.

**Table 4.4: An overview of maximum obtained responses in each group**

AGE GROUP	EXISTING VERBS	NONCE VERBS	TOTAL
3 (N=12)	145	145	290
4 (N=12)	120	120	240
5 (N=12)	130	130	260
6 (N=10)	150	150	300

#### 4.4 Procedure and materials

The children were tested individually in a controlled experimental setting. The test session was run by two researchers. The aim of the experiment was to elicit a subject, a finite verb and a direct object. This combination is crucial for determining whether or not the child is able to appropriately use a finite verb form. Recall from Chapter 3 that the Dutch infinitive and the finite plural form are both marked by the suffix *-en*. If a child placed a verb with an *-en* suffix in front of the direct object, she was thought to use a finite form as in (2a). However, when the same verb form follows the object, the child was thought to produce a non-finite form (i.e. root infinitive) as in (2b).

- (2) a. *Kinderen **tekenen** een zon.*  
 Children draw [+FINITE] a sun [OBJECT]
- b. *Kinderen een zon **tekenen**.*  
 Children a sun [OBJECT] draw [-FINITE]

The test was presented to the children as a game, in order to maintain the children's attention. The session started by introducing the nonce verbs, after which the child took part in two tasks: a sentence completion task, and an activity task. For the sentence completion task, I used colored printed photographs which were taken with a digital camera. The photographs were placed in a booklet in a pseudo-randomized order. Filler pictures which were not relevant to children's knowledge of verbal inflection were also included. The fillers represented items from the gender attribution test, which is discussed in detail in Chapter 6. Table 4.5. provides an overview of the objects that I used in the activity tasks.

**Table 4.5: An overview of objects used for performing the activities**

TEST ITEM	OBJECTS
<i>Drinken</i> 'to drink'	a cup
<i>Tekenen</i> 'to draw'	paper and a pencil
<i>Pieren</i> 'to pier'	a pier* and a spoon
<i>Spollen</i> 'to spol'	a spoller* and a toothbrush

\*Images of these objects are given in (3).

Because young children are often more willing to interact with a puppet than they are with an adult (Thornton, 1996), a puppet was used in two of the activity tasks. The puppet appeared in the test session after the introduction of the nonce verbs. He then asked the child if she would participate in a game. The experimenter told the child that the puppet was too shy to talk to grown-ups but was willing to talk to children. The experimenter explained that the child's help was very important because otherwise the game could not continue. Table 4.6 shows how the test session was structured, and offers additional information about whether the task included a puppet and/or assistance of a second researcher.

**Table 4.6: A scheme of a test session**

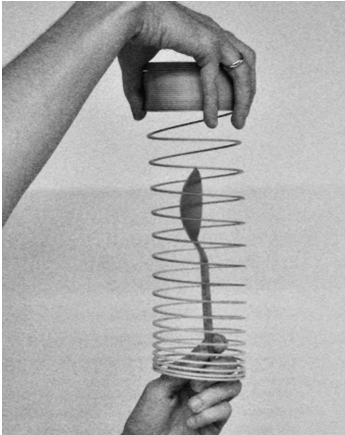
TEST SCHEME	PUPPET	ASSISTANCE
Introduction nonce verbs	no	no
Introduction puppet	yes	yes
Activity description task 2SG-INV	yes	yes
Activity description task 1SG	yes	yes
Activity description task 2SG	no	yes
Sentence completion task 3SG/3PL	no	no

Four of the six parts in the test session required assistance of a second experimenter. The second experimenter either played the role of the puppet or assisted the child by handing her the objects. In the remaining conditions, the assistant observed the session and took notes. In total, the test lasted approximately 30 minutes. In general, the younger the child, the longer the test session took. Each task included a preliminary test trial to make sure that the child understood the instructions correctly. The verb *lezen* ‘to read’ was used as a practice item. In the paragraphs below, I will explain how nonce verbs were introduced and how the tasks among the various conditions were carried out.

#### *Introduction nonce verbs*

The experimenter used two novel objects named a ‘pier’ and a ‘spoller’ in order to introduce the nonce verbs. (3) provides images of pier and spoller.

## (3) Images of a 'pier' (on the left) and a 'spoller' (on the right)



To avoid triggering infinitival forms or imitation of finite forms in the present tense, the nonce verbs were presented in the past participle form. An example of the nonce verb *pieren* can be found in (4), along with its other morphological forms.

- (4) a. infinitive: *pieren*  
 b. finite forms: *pier, piert, pieren*  
 c. past participle: *gepiert*

During the introductory session, the experimenter encouraged the child, herself to act out and name the activities. After introducing the nonce verbs, the experimenter verified that the child had memorized them accurately. Elicitation tasks only began after experimenters were sure that children had accurately learned the nonce verbs. If, during the elicitation task, the child failed to retrieve the nonce verb, the experimenter was permitted to help the child by naming the object. If this cue did not help, the introduction session was repeated. The procedure for introducing nonce verbs is given in (5). The italics represent the Dutch forms, in which the nonce verbs are introduced.

- (5) Now we are going to do something funny. Look, I've brought some things with me. This is a 'spoller' and that is a 'pier' [experimenter shows the objects]. Look what you can do with it [experimenter performs the

activity]. With the spoller, I have *gespold* and with the pier I have *gepierd*. Now it is your turn.” [experimenter and the child play together with the objects for several minutes until the child can name the activities herself]

During the introduction session, it was apparent that some three-year-old children were not at ease in learning the new words. This resulted in a situation where children did not want to repeat the nonce verbs or stopped talking altogether. In these cases, the experimenter ended the session. In total, five sessions were ended after the introduction.

*Activity task for 2SG-INV*

The aim of this task was to elicit finite verbs in 2SG-INV in inversion. This was achieved by letting the child ask a WH-question to the puppet. The task proceeded as follows: While the puppet was performing an activity with the object(s), the experimenter instructed the child to ask the puppet a WH-question. An example is given in (6), which illustrates the task for the verb *tekenen* ‘to draw’.

- (6) PUP: [performs the activity of drawing]  
 EXP: [instructs the child to ask the puppet WH-question]  
*De pop is aan het tekenen. Vraag hem wat.*  
 ‘The puppet is drawing. Ask him what.’  
 CHI: ***Wat teken je?***  
 ‘What are you drawing?’  
 PUP: [gives a response to the child]

Although the instruction of this task was generally simple for children to understand, some three-year-olds had difficulty forming WH-questions. In these cases, children either provided the answers themselves, or repeated the WH-word without adding the verb. In total, two children failed to respond on this task.

*Activity task in 1SG*

The aim of this task was to elicit finite verbs in the 1SG. At the beginning of this task, the puppet was blindfolded. The task of the child was to perform the activities and to describe the ongoing activity to the puppet. The experimenter



explained to the child that the puppet was very curious about what was happening, but, unfortunately, was not able to see it. An example of the task procedure for a nonce item *pieren* is given in (7).

- (7) EXP: [gives a ‘pier’ and a spoon to the child]  
 CHI: [takes the objects and performs the novel activity]  
 PUP: *Wat gebeurt er?*  
 ‘What’s happening?’  
 CHI: ***Ik pier een lepel***  
 ‘I pier (nonce verb) a spoon.’  
 PUP: [gives a response to the child]

In this task, some three- and four-year-olds had difficulty taking the perspective of a blindfolded puppet and hence, did not see why they would have to describe the ongoing action. In order to prevent loss of responses, it was helpful to first let the child experience the blindfold for themselves.

*Activity task in 2SG*

The aim of this task was to elicit finite verbs in 2SG. At the beginning of this task, one experimenter was blindfolded. The blindfolded experimenter also performed the activities. The task of the child was to describe to the blindfolded experimenter, the ongoing activity since she could not see it herself. The second experimenter assisted the child by handing over the objects. In (8), is an example of the task for an item *drinken* ‘to drink’.

- (8) CHI: [gives a cup to the blindfolded experimenter]  
 EXP: [takes the cup and pretends drinking]  
*Wat gebeurt er?*  
 ‘What’s happening?’  
 CHI: ***Je drinkt uit een beker***  
 ‘You’re drinking from a cup.’  
 EXP: [gives a response to the child]

In this task, some children correctly noted that, even if the experimenter could not see the object(s), she was able to feel what she was doing. Thus, for these children, it did not seem logical to describe the ongoing activity to the blindfolded experimenter. However, in this task, the loss of responses was

minimal, as children generally had no problem accepting the explanation that it was simply part of the game.

*Sentence completion task in 3SG and 3PL*

The sentence completion task was used to obtain data about the 3SG and 3PL contexts in declarative main clauses. In this task, contrasting images were presented in pairs and children were instructed to describe the contrast between the two adjacent pictures, e.g. reading a book vs. reading a newspaper by completing the sentence which was started by the experimenter. This is illustrated in (9).

(9) Example of elicitation of the 3SG and 3PL verb forms by means of sentence completion task.



*dit meisje leest een boek*  
'this girl is reading a book'



*en de ouders lezen een krant*  
'and the parents are reading a paper'

This task proceeded as follows: The experimenter triggered the sentence by pronouncing the underlined words in (9) and the participant's role was to complete the sentence (the correct subject responses are in bold). It should be mentioned that a potential risk of this task was that children might single out one of the characters when describing the action depicted in the 3PL test items. Consequently, when a child produced 3SG instead of 3PL, it was not possible to resolve whether that child referred to only one of the two characters and

correctly produced the 3SG or whether she produced incorrect inflection. In order to avoid this ambiguity as much as possible, I only chose subjects that were naturally plural such as *de kinderen* ‘the children’ or *de ouders* ‘the parents’. In addition, the experimenter introduced each picture by naming the subjects first. For example, in (9), the experimenter would first point at the pictures and say ‘Look, here is a girl and here are her parents’. After this introductory sentence, the experimenter proceeded with the sentence completion task as described above.

#### 4.5 Data analysis

Children’s responses were divided into five categories: (1) correct finite verb, (2) incorrect finite verb, (3) alternative construction, (4) irrelevant response and (5) unintelligible or no response. A finite verb was scored as ‘correct’ when a target morpheme was realized in a given context. Contrastively, a finite verb was scored as incorrect when a non-target morpheme was produced in a given context. An example of a correct response in the second person is provided in (10a) and examples of incorrect responses are provided in (10b).

(10) a. *jij tekent een zon*  
‘you draw a sun’

b. *jij teken een zon*  
*jij tekenen een zon*

The category of alternative constructions refers to responses in which the lexical verb (i.e. the test item) was not finite. Instead, the lexical verb was produced in its non-finite form in sentence final position. The following constructions were also scored as alternative constructions: the present progressive in (11), root infinitives in (12), and so called dummy auxiliaries (i.e. periphrastic verbs that consist of auxiliary + infinitive (Jordens, 1990; Hollebrandse and Roeper, 1996; Van Kampen, 1997; Zuckerman, 2001)) as illustrated in (13).

(11) *Ik ben water aan het drinken.*  
I am water drink –INF  
‘I am drinking water.’

(12) *water drinken*  
 water drink –INF  
 ‘drink water’

(13) *ik ga water drinken*  
 I go water drink –INF

The response was scored as a root infinitive when the verb containing the *–en* inflection followed the direct object and no auxiliary was present (see also Section 4.4). Note that dummy auxiliaries, such as in (13), do not contribute to the utterance’s meaning; that is, a sentence with dummy auxiliary + infinitive has the same denotation as a sentence with a finite main verb (Zuckerman, 2001). Dummy auxiliaries are present in order to make the sentence finite (Jordens, 1990). The category of dummy auxiliaries includes the verbs *gaan* ‘go’ and *doen* ‘do’. Whereas *gaan* ‘go’ in adult Dutch denotes a future meaning, children may use it to denote an ongoing activity. For example, during a test session a child might say *Ik ga tekenen* ‘I go draw’ although she has already started drawing. As for the verb *doen* ‘do’, a construction such as *Jij doet drinken* ‘You do drink’ is considered appropriate only in Southern dialects in the Netherlands (Cornips, 2000; Blom and DeKorte, 2008).

The category of irrelevant responses includes omissions of a direct object as in (14a) and uses of a non-target verb as in (14b).

(14) a. *de kinderen lezen*  
 ‘the children read’

b. *de ouders staan bij de muur*  
 ‘the parents stand near the wall’

## 4.6 Results

In order to keep the overview of the results clear, this section is divided into four subsections. In 4.6.1, I will describe how the response types are distributed across existing and nonce verbs. In 4.6.2, I will report on data quantification by means of percentages of correct inflection, whereas in 4.6.3, I will report on effects of age and test conditions on children’s linguistic productions. Subsection 4.6.4 focuses on error analysis.

### 4.6.1 Response types

In order to find out whether or not children performed differently with existing and nonce verbs, I will begin with an overview of the distributions of response types, as presented in Tables 4.7 and 4.8.

**Table 4.7: Response types with existing verbs**

Age group	Correct inflection	Incorrect inflection	Alternative construction	Irrelevant	Unintelligible/No response
3 (N=145)	65 %	4 %	24 %	3,5%	3,5%
4 (N=120)	85 %	6 %	6 %	1,5%	1,5%
5 (N=130)	92 %	2 %	4 %	0,5%	0,5%
6 (N=150)	98 %	0 %	2 %	0 %	0 %

N=number of analyzed responses

**Table 4.8: Response types with nonce verbs**

Age group	Correct inflection	Incorrect inflection	Alternative construction	Irrelevant	Unintelligible/No response
3 (N=145)	64 %	7 %	23 %	3 %	3 %
4 (N=120)	82,5%	5 %	7,5%	2,5%	2,5%
5 (N=130)	94 %	3 %	2 %	0,5%	0 %
6 (N=150)	90,5%	0 %	8 %	0,5%	0,5%

N=number of analyzed responses

The percentages presented in Tables 4.7 and 4.8 indicate that children's response types were, more or less, the same with nonce verbs and existing verbs (for information about the raw figures, see Appendix 4.2). The overall percentages of incorrect inflection (all conditions collapsed) were extremely low across age groups (between 0 – 7%). It is evident that three-year-olds produced a higher percentage of alternative constructions as compared to other groups. It is possible that children who used alternative constructions where the target verb is in an infinitival form, were actually avoiding the finite verb inflection. I will return to this issue in Section 4.7.

Correlational analyses were carried out in order to compare children's within-subject performance on nonce versus existing verbs. Kendall's non-parametric test of correlation revealed a significant association between the frequency of children's correct inflection with existing and nonce verbs ( $\tau = .77$ ,  $p < .01$ ). Similarly, a significant correlation was found between children's use of alternative constructions with existing and nonce verbs ( $\tau = .835$ ,  $p < .01$ ). The results of the correlations demonstrate that children's performance was consistent with existing verbs and nonce verbs.

Returning to Tables 4.7 and 4.8, unanalyzable responses (irrelevant responses, unintelligible responses, and no responses) fell under 5% in each age group. These responses are not included in further analyses.

#### 4.6.2 Accuracy

The aim of the accuracy analysis was to assess the extent to which children at different ages produced correct finite verbal inflection. This analysis focused solely on *subject – verb – object* responses and on *wh-word – verb – subject* responses since these constructions are the only ones which allow us to conclusively evaluate the degree to which children correctly use finite verbal inflection (see also Section 4.4). It is worth mentioning that there is no pre-established criterion for establishing whether an item is or is not acquired. Some studies look at the first correct appearance of a given morpheme whereas others establish a cut-off point based on children's percentage of correct usage in obligatory contexts. Brown's (1973) criterion is one of the better known criteria, which states that a morpheme is considered as acquired when it appears correctly in at least 90% of obligatory contexts (Brown, 1973). It should be noted, however, that Brown set the cut-off point for acquisition at 90% because he observed that, when children's acquisition data were represented

graphically, the accuracy curve for some particular morphemes was initially chaotic. Once that curve had passed the 90% line, however, it tended to remain above that line. This observation implies that it is not necessarily the 90% threshold that guarantees the acquisition of a morpheme since the criterion is somewhat arbitrary. Instead, a more reliable assessment would entail determining when children are able to use a particular morpheme systematically and consistently with a high accuracy rate. In other words, it is reasonable to believe that children might actually have acquired a particular morpheme, without having reached Brown's 90% mark, assuming they are consistently accurate for an extended period of time.

Tables 4.9 and 4.10 show children's accuracy rates for existing verbs and nonce verbs. The test conditions are listed in the first row in the tables. Table 4.9 shows that children in all age groups are highly accurate with existing verbs.

**Table 4.9: Existing verbs: % correct in various test conditions**

AGE GROUP	1SG	2SG	2SG-INV	3SG	3PL
3 (N=12)	<b>94%</b> 15/16	<b>95%</b> 19/20	<b>93%</b> 25/27	<b>88%</b> 15/17	<b>100%</b> 14/14
4 (N=12)	<b>100%</b> 19/19	<b>81%</b> 17/21	<b>95%</b> 19/20	<b>89%</b> 17/19	<b>100%</b> 23/23
5 (N=12)	<b>100%</b> 25/25	<b>92%</b> 23/25	<b>100%</b> 26/26	<b>95%</b> 21/22	<b>100%</b> 22/22
6 (N=10)	<b>100%</b> 30/30	<b>100%</b> 30/30	<b>100%</b> 30/30	<b>100%</b> 29/29	<b>100%</b> 28/28

However, one may notice that the four-year-olds are accurate only 81% of the time in the 2SG condition. This is relatively low compared to the other conditions. In total, the four-year-olds produced four inflectional errors out of 21 scorable responses. However, two errors in this condition can be attributed to a single child who persistently did not produce the *-t* suffix in the test. This particular child replaced the target *-t* suffix with either the *-∅* suffix or used an

alternative construction. In the conditions which did not require the *-t* suffix, the child's performance was accurate. The remaining two errors were produced by two different children.

Table 4.10 presents the results of the accuracy analysis with nonce verbs.

**Table 4.10: Nonce verbs: % correct in various test conditions**

AGE GROUP	1SG	2SG	2SG-INV	3SG	3PL
3 (N=12)	<b>72%</b> 13/18	<b>100%</b> 20/20	<b>85%</b> 22/26	<b>100%</b> 14/14	<b>93%</b> 14/15
4 (N=12)	<b>100%</b> 16/16	<b>94%</b> 17/18	<b>100%</b> 22/22	<b>82%</b> 18/22	<b>95%</b> 20/21
5 (N=12)	<b>100%</b> 25/25	<b>92%</b> 23/25	<b>96%</b> 25/26	<b>100%</b> 23/23	<b>95%</b> 22/23
6 (N=10)	<b>100%</b> 26/26	<b>100%</b> 27/27	<b>100%</b> 30/30	<b>100%</b> 25/25	<b>100%</b> 28/28

Children across age groups were highly accurate with nonce verbs. In most conditions, the accuracy level was above 90%. In this respect, the children's performance with nonce verbs resembled their performance with existing verbs. A percentage lower than 90% was found in two groups: the group of three-year-olds in the 1SG condition (72%; five errors); and in the 2SG-INV condition (85%; four errors). Each of these conditions required the *-ø* suffix. The accuracy rate for the four-year-olds was 82% in the 3SG condition. This figure reflects the performance of a single child (who was already discussed with regard to the accuracy in existing verbs), who consistently failed to produce the *-t* suffix. This child was responsible for two of the four errors. One might expect that this particular child's performance would also affect the accuracy of the 2SG in the four-year-olds since this condition also requires the *-t* suffix. With the data currently available, this possibility cannot be ruled out since, in each 2SG condition, this child systematically produced alternative constructions instead of finite verbs.



The performance of the child in the 4-year-old group who consistently failed to produce the *-t* suffix could mean that many of the errors were produced by a small number of children. This is not the case, however. Instead, inflectional errors are distributed evenly across children and cannot be ascribed to one or two individual subjects. In the younger groups (the three- and four-year-olds), at least half of the children err at least once in the test.

### 4.6.3 Effect of test conditions and age

The accuracy analysis in the previous section showed that children produced correct inflection far above chance level for both existing and nonce verbs. However, the accuracy analysis in 4.6.2 did not take into account the relationships between the three variables: age, test condition, and accuracy rate. A more robust statistical test was therefore needed to investigate the extent to which one variable can be explained or predicted by one or more of the other variables. For this data, a Multinomial Logistic Regression (henceforth: MLR) was appropriate (as described in Nooteboom and Quené, 2008). The aim of MLR was to address two questions. The first question was whether or not children's accuracy-rates varied per condition and the second question was whether children's accuracy-rates varied across ages. Before I turn to the presentation of the results I will briefly address the basic principles of the MLR analysis.

MLR is appropriate to use when one is interested in determining the impact of more than one independent variables on a dependent variable. The dependent variable must be nominal and must consist of more than two categories.<sup>6</sup> In the present study, the independent variables are age and test condition; and the dependent variable is children's response on the verbal inflection test. The dependent variable is nominal and consists of a set of three categories: (1) correct inflection, (2) incorrect inflection and (3) alternative construction. When using MLR, one category of the dependent variable must be chosen as the comparison category in order to determine a proportion. For this data, the category of correct inflection was chosen as the comparison category. The MLR determined whether the proportions of incorrect responses

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<sup>6</sup> Nominal variable refers to a set of categories, which cannot be ordered in any meaningful way. In contrast, an ordinal variable refers to a set of categories, which can be ordered on a scale such as highest degree or social class. In addition, when the nominal variable is dichotomous in nature (there are only two categories) the statistical analysis known as logistic regression is used.

and the proportions of the alternative constructions were affected by the independent variables (test conditions and age).

My data contained two kinds of variation with respect to children's responses: First, I did not obtain an equal number of scorable responses from each child and second, the individual children varied in their response category within test conditions. An example of the latter would be if, in the 1SG, a child responded differently to each of the four test items. In an extreme example, a child could have, for example used correct inflection with the first test item, incorrect inflection with the second, an alternative construction with the third, and no response with the fourth. In order to assess the variability in the data, I used a two stage-bootstrap with replacement procedure (Nooteboom and Quené, 2008). The bootstrap technique works as follows: A random sample of 44 children out of 45 was drawn with replacement. From the 44 children, 15 responses are drawn with replacement. This procedure is repeated 250 times, which provides 250 regression coefficients. The distribution of the coefficients indicates the variability across the participants as well as the variability across the responses.

Tables 4.11 and 4.12 summarize the mean coefficients, the floor (2.5%) and the ceiling (97.5%) level of the confidence intervals for incorrect inflection in existing and nonce verbs, respectively.

**Table 4.11: Coefficients for incorrect inflection in existing verbs.**

VARIABLE	COEFFICIENTS		
	MEAN	2.5%	97.5%
1SG	-12.80	-59.03	-2.93
2SG	-3.19	-12.98	-1.18
2SG-INV	-6.58	-22.22	-2.43
3SG	-3.97	-16.03	-1.68
3PL	-19.33	-77.76	-10.45
AGE	-1.08	-2.55	-0.13

**Table 4.12: Coefficients for incorrect inflection in nonce verbs**

VARIABLE	COEFFICIENTS		
	MEAN	2.5%	97.5%
1SG	-3.80	-16.41	-1.47
2SG	-4.36	-16.36	-1.86
2SG-INV	-4.12	-12.43	-2.09
3SG	-4.58	-17.77	-1.83
3PL	-4.42	-17.21	-1.64
AGE	-1.04	-1.99	-0.33

The negative values of the coefficients imply that children's produce incorrect inflection less frequently than they do correct inflection. The mean coefficients with the highest negative value, such as in 1SG and 3PL in Table 4.11, show that children were almost error-free in these conditions. However, the overlap of the confidence intervals across various conditions means that none of the conditions significantly affected children's realization of incorrect inflection. In other words, none of the conditions posed a greater problem for children than the others. With regard to effects of age, the crucial information was whether the ceiling level (97.5%) of the confidence interval differs from the zero value. As can be seen in both Table 4.11 and Table 4.12 the 97.5% confidence interval indicates a negative value for age. This implies that one can be 97.5% confident that the proportion of incorrect inflection decreased with age.

Similar results were found for children's production of alternative constructions. Tables 4.13 and 4.14 presents the mean coefficients, the floor and ceiling confidence intervals for the proportion of correct inflection and alternative constructions in existing and nonce verbs, respectively.

Table 4.13: Coefficients for alternative constructions in existing verbs.

VARIABLE	COEFFICIENTS		
	MEAN	2.5%	97.5%
1SG	-2.09	-3.49	-1.13
2SG	-2.67	-4.40	-1.25
2SG-INV	-9.08	-42.80	-2.8
3SG	-1.68	-3.12	-0.78
3PL	-1.76	-3.39	-0.65
AGE	-1.28	-2.57	-0.58

Table 4.14: Coefficients for alternative constructions in nonce verbs.

VARIABLE	COEFFICIENTS		
	MEAN	2.5%	97.5%
1SG	-1.45	-2.81	-0.49
2SG	-2.47	-4.18	-1.33
2SG-INV	-8.34	-22.82	-2.55
3SG	-1.41	-2.52	-0.58
3PL	-1.68	-2.66	-0.77
AGE	-0.9	-1.87	-0.18

The overlap of confidence intervals in Tables 4.13 and 4.14 indicates that the proportion of alternative constructions did not vary significantly across the test conditions. As was the case with the incorrect forms, a significant negative effect of age was observed for both existing and nonce verbs, indicating that the use of alternative constructions decreases with age.

#### 4.6.4 Error profile

Sections 4.6.2 and 4.6.3 have shown, first of all, that the children were highly accurate in using inflection, both with existing and nonce verbs. The accuracy analysis revealed that the amount of inflectional errors that children produced was 4% (36 errors in 913 finite contexts). However, how systematic are the errors that do occur? This question is relevant to the discussion of form-feature specification of the Dutch verbal system because a particular feature specification may prevent children from using a certain morpheme, which could inflate the use of another (underspecified) morpheme.

The results in 4.6.3 address this issue by showing that children's error-rates did not vary significantly across conditions. If the children showed a clear-cut error profile, e.g. if they had overused only one particular morpheme, this would have resulted in significant differences across conditions. For example, a strong preference for the  $-\emptyset$  suffix would have resulted in a relatively high proportion correct in 1SG as well as in 2SG-INV and less accurate behavior in other conditions. If the children had preferred the  $-t$  suffix, this would have resulted in a high proportion correct in the 2SG and 3SG and lower accuracy-rates in all the rest. Finally, if the children had preferred the  $-en$  suffix, the plural condition would have showed higher accuracy than singular conditions. However, because of the low number of errors, such a quantitative approach did not work. Therefore, in this section I will take a closer look at children's error profiles. Table 4.15 shows the distribution of the morphemes across conditions. The grey cells in the table represent the contexts in which the morpheme was realized correctly. The error-analysis is based on data of children between three and five years. I excluded data from the six-year-olds because they reached 100% accuracy in all conditions.

Table 4.15: Error-profiles in verbal inflection

CONTEXT	STEM + $\emptyset$	STEM + $t$	STEM + $en$
1SG	95 % 113/119	5 % 6/119	0 % 0/119
2SG	7,5% 10/129	92,5% 119/129	0 % 0/129
2SG-INV	94,5% 139/147	5,5% 8/147	0 % 0/147
3SG	7,5% 9/117	92,5% 108/117	0 % 0/117
3PL	1 % 1/118	1,5% 2/118	97,5% 115/118

Table 4.15 shows a striking contrast between the  $-en$  suffix, on the one hand, and the  $-t$  and the  $-\emptyset$  suffixes, on the other. Whereas no instances of overuse of the  $-en$  suffix were found in finite contexts, overuse of both the  $-t$  and the  $-\emptyset$  suffixes were present. In other words, when children used a finite verb inaccurately, they produced the  $-t$  or the  $-\emptyset$  suffix. Overuse of  $-en$  was not attested.

#### 4.7 Interpretation of the results

The goal of the present investigation was to gather new evidence in order to examine the acquisition of finite verbal morphemes by analyzing elicited production data from Dutch monolingual children between ages three and six. The questions addressed in this study were: (1) *To what extent do the data from child Dutch support the idea that children know agreement inflection from early on?* And (2) *To what extent can salience account for the order of acquisition of inflectional morphemes in monolingual Dutch children?*

The main finding is that finite verbal inflection is acquired at the age of three. By carefully analyzing the data for five inflectional contexts, I found high percentages of accuracy in both existing and nonce verbs. In Section 4.3, I

argued that performance with nonce verbs reflects productivity of inflection rules. Children's performance with nonce verbs was therefore crucial in assessing the claim that children have early knowledge of inflection (Wexler, 1998). First of all, individual children showed consistent linguistic behavior with existing and nonce verbs: The occurrence of inflectional errors as well as occurrence of alternative constructions was highly similar for both types of verbs. This suggests that the children did have knowledge of inflection, since they are equally productive with both types of verbs. If children did not have knowledge of verbal inflection, and hence, relied on lexical storage, one would have expected to find differences in their performance with nonce verbs and existing verbs. If this were the case, children would have been expected to correctly inflect the existing verbs but err or use alternative constructions with nonce verbs, which was not the case.

Results from the accuracy analysis (Table 4.10) indicated that three-year-old children correctly used subject verb agreement with nonce verbs above 90% of the time in three of the five conditions. The few errors that the three-year-olds did make involved the 1<sup>st</sup> person singular (five errors; accuracy rate 72%) and the 2<sup>nd</sup> person singular in inversion (four errors; accuracy rate 85%). Statistical analysis using Multinomial Logistic Regression (MLR) (Section 4.6.3) revealed that children's use of inflection was stable across all test conditions: Children did not produce significantly more inflectional errors nor did they produce more alternative constructions in any specific condition. This implies that monolingual Dutch children know all finite morphemes equally well. Based on these findings I conclude that Dutch three-year-olds have target-like knowledge of the verbal inflectional paradigm and that they understand that subject-verb agreement is obligatory.

Despite the overall low percentage of inflection errors (4%; 36 errors in 913 finite contexts), an effect of age did prove to be significant: Children become more accurate as they grow older. The next logical question to ask is: How might one explain this age effect? It has been proposed that children's ability to produce particular (morphological) forms breaks down under certain task-related conditions (Hadley, 1998; Elin Thordardottir, 2008). According to Leadholm and Miller (1992), conversation is the least demanding discourse context since it is relatively unstructured and unplanned. In contrast, elicitation tasks entail one's ability to process the task instructions, to memorize the instructions (and test items), to take the perspective of another person, and to

plan one's own response. Given these demands, an elicitation task is one of the most complex types of discourse required by children.

The less-developed skills of the younger children in the elicitation task were evident in the testing sessions: Although the youngest children demonstrated a general understanding of the tasks, they sometimes experienced difficulties in grasping what type of response the experimenter sought. For example, if for the target response *jij tekent* 'you draw' a child responded by using an alternative construction (e.g. *jij gaat tekenen* 'you go draw'), the researcher encouraged the child to instead inflect the lexical verb by asking questions such as *wat zeg je? kook ik* 'what do you say? do I cook'. I observed that this intervention sometimes triggered reactions such as 'I've said it already', which I interpreted as, 'I don't really understand what you want me to say'. In some cases, the experimenter's intervention led to the child becoming aware that her response was not adequate. Typically, this made the child feel uneasy and the child often became reluctant to complete the task.

The tendency for the frequency of alternative constructions to decrease with age can be viewed as an extra argument for the task-effects: Children do not fail to produce correct inflection but they instead fail to produce the type of response required by the test. In addition, younger children tended to have more difficulties memorizing the nonce verbs, and they also had more difficulty to act out the tasks. This is not surprising, given that, at this age, children's memory skills and their ability to take other people's perspective into consideration are still developing (see Case, 1985; 1992; Case and Okamoto, 1996 for development of memory and Piaget, 1926 on development of egocentrism in children). Thus, the tendency for children to become more accurate with age and their tendency to use fewer alternative constructions with age does not necessarily suggest that younger children have not acquired the finite morphemes. Instead, their performance over time likely reflects their developing cognitive and socio-emotional skills.

Based on the hypothesis that children's attention is drawn to the most salient morphemes, I predicted that, in Dutch verbal inflection, children would acquire the non-finite *-en* morpheme first, followed by the set of finite morphemes. The findings summarized in the literature overview in Chapter 3 provided sufficient evidence for the early acquisition of non-finite *-en*. With respect to the acquisition of finite morphemes, the data obtained in the present study do not allow me to draw conclusions about whether or not salience accounts for the acquisition of finite morphemes. This is due because Dutch children have already reached ceiling level by the age of three.



In Section 4.6.4, I argued that error analyses were necessary in order to gain insight into children's form-feature specifications in the target system. Given that the error analysis was based on residual errors resulting from task-effects, I believe that, with respect to feature representation, error-profiles can only be informative when systematic patterns are detected. I could assume, for example, that, when confronted with increased processing demands (such as task effects), children may occasionally fall back on a less specified form. This, in turn, may provide an indication about which morphemes are more problematic for children in the earlier stages. A similar idea was proposed for second language learners in the Missing Surface Inflection Hypothesis (e.g. Haznedar and Schwartz, 1997; Lardiere, 1998; Prévost, 2003).

Returning to the children's error patterns, it was clear that children did not use the *-en* suffix as a finite substitute in the singular contexts (Table 4.15). This pattern of usage is consistent with an error-pattern found in the spontaneous speech of four Dutch children aged 1;8 to 3;4 (Blom and Polišenská, 2006). Given the form-feature specification presented in Chapter 3, repeated in (15), the *-en* suffix is correctly specified for the features [+FIN; +PL].

(15)	/t/	↔	[+FIN; -SP; -PL]
	/en/	↔	[+FIN; +PL]
	/ø/	↔	[+FIN]
	/en/	↔	[-FIN]

Importantly, the non-existent overuse of the *-en* in the finite contexts is in line with the claim that the *-en* suffix has two distinct feature representations, namely the [-FIN] *-en* and the [+FIN; +PL] *-en* (Haeseryn et al., 1997; Aalberse, 2009). In a feature representation where the *-en* suffix is completely underspecified and is considered the default (Wexler et al., 2004; Bennis and MacLean, 2006), such a pattern would not be expected.

The second conclusion from the error-analysis was that, within a finite paradigm, children substitute two suffixes: When children realize incorrect inflection, they overuse both the *-t* and the *-ø* suffixes across various contexts. Unfortunately, the unsystematic character of this pattern is not reliable evidence with respect to finite default. Based on the striking contrast between the finite *-en*, on the one hand, and the finite *-t* and *-ø*, on the other, I speculate that, in the acquisition process, the finite *-en* behaves differently from the other finite

suffixes. If this speculation is true, I expect that, children will detect the contrastive pattern from early on. I will return to this in detail in Chapter 5.

#### 4.8 Conclusion

Finite verbal inflection does not constitute problems for three-year-old monolingual Dutch children. In this chapter, I have presented evidence that three-year-old children have already mastered all finite morphemes. Dutch children's high accuracy with existing verbs as well as with nonce verbs is consistent with the claims made by VEKI. Since I found that the children were no longer developing finite verbal inflection, my predictions based on salience cannot be tested on the basis of the elicited production data. The analysis of the residual inflectional errors, however, might point in a direction regarding which morphemes are more problematic for children in the earlier stages. The error-analysis suggested that the *-en* suffix is not completely underspecified: The non-existent overuse of the *-en* in the finite singular contexts suggests that the non-finite *-en* and the finite *-en* have distinct feature representations. Moreover, the error-analysis suggested that the finite *-en* morpheme behaves differently than the other finite morphemes. Further research with younger children is needed in order to investigate this suggestion. I will turn to this point in the next chapter.

# 5

## Perception of finite verbal inflection

In the previous chapter, I concluded that, at the age of three, Dutch children have knowledge about the rules of finite verbal inflection and that they know that subject-verb agreement is obligatory. This suggests that children's acquisition of inflection takes place before this age. In order to look closer into the development of finite morphemes it is necessary to track children's development in earlier developmental stages. Due to the cognitive demands of the task itself, it is not possible to use the same elicitation tasks with the younger children as it was with the older children. The elicitation tasks that were used with the three-year-olds require several skills on behalf of the children. First, they have to learn nonce verbs. In addition, they have to place themselves in the perspective of 1<sup>st</sup> and 2<sup>nd</sup> person, and, in order to produce inversion in the 2<sup>nd</sup> person, they must also be able to ask questions. All of these tasks together are too demanding for children younger than three years. Thus they are not therefore suitable (Thornton, 1996).

As discussed in Chapter 1, Section 1.2, there are also limitations in using spontaneous speech data. Put briefly, these types of data do not allow one to effectively evaluate children's productive use of agreement inflection.

In order to examine the development of inflection in younger children, I will use an experimental technique that does not require children to produce language. In 1995, Kemler Nelson et al. discussed the possibility of exploring young children's language capabilities by using the Headturn Preference Paradigm (henceforth: HPP). HPP is an experimental technique which measures the mean length of time that infants look in the direction of an auditory stimulus. It uses this measure (looking time) as an indicator of infants' preference. The main objective of this procedure is to establish whether infants prefer one kind of stimulus over another. A preference for one stimulus over another is believed to reflect infants' ability to discriminate between the two

stimuli. There are a number of reasons why this procedure is well-suited for studying infants' language: First, the procedure does not require infants to intentionally communicate. For example, they are not required to point, answer questions, or act out commands. Infants are simply required to employ their visual attention in order to fulfill the requirements of the task.

On the basis of the results obtained from the elicited production data (see Chapter 4), a perception experiment using HPP was developed for 18 – 19 month old infants. The primary aim of this experiment was to examine whether Dutch infants perceive violations of inflection rules. That is, do young Dutch children differentiate between grammatical and ungrammatical sentences? This chapter is organized as follows: Section 5.1 summarizes perception studies, which show that infants are sensitive to various properties of functional morphemes. Section 5.2 introduces the research question and the linguistic variables in this experiment. Section 5.3 describes the methodology of the study. Results are presented in Section 5.4, followed by an interpretation of the results in Section 5.5. In Section 5.6, I discuss some issues regarding children's listening preferences and the HPP. Finally, in Section 5.7, I conclude the chapter.

## 5.1 Perception studies and morphosyntactic development

A number of perception studies using HPP have demonstrated that infants are sensitive to functional morphemes before they, themselves, begin to use them (Kemler Nelson et al., 1995; Jusczyk, 1998). It has been shown, for example, that 16-month-old infants acquiring English preferred to listen to strings of morphemes which were in the correct sequential order (e.g. *the kitten was hiding*) over sentences with morphemes that didn't follow standard English order (e.g. *was kitten the hiding*). Infants between 12 and 14 months, however, did not demonstrate a preference in either condition. Sensitivity to morphosyntactic dependencies between functional morphemes has also been found in 18-month-old English, Dutch, and German infants (Santelmann and Jusczyk, 1998; Wilsenach, 2006; Höhle and Weissenborn, 2003, respectively). Santelmann and Jusczyk (1998) investigated whether 15- and 18-month-old infants acquiring English were sensitive to morphosyntactic dependencies. In the experiment infants were exposed to a grammatical dependency between the auxiliary verb *is* and a main verb suffixed by *-ing* and an ungrammatical combination between the modal verb *can* and a main verb suffixed by *-ing*. The

results of this study showed that 18-month-old infants, but not 15-month-old infants, listened longer to passages containing grammatical dependencies between the auxiliary and the suffix on the main verb (e.g. *is mixing*). 18-month-old infants, did not listen as long to passages containing ungrammatical dependencies between the auxiliary and the suffix on the main verb (e.g. *\*can mixing*). The results of Santelmann and Juczyk (1998) were confirmed in a perception study with Dutch infants, whose ages ranged from 18 to 22 months (Wilsenach, 2006). Wilsenach studied the morphosyntactic dependency between the past participle prefix *ge-* and the auxiliary verb *beeft* 'has'. The infants in this study were divided into two groups: a test group of infants with a genetic risk of developing dyslexia, and a control group of typically developing infants. The infants were presented with grammatical passages (e.g. *de zon heeft geschinen* 'the sun has shined') and ungrammatical passages (e.g. *\*de zon kan geschinen* 'the sun can shined'). Wilsenach found that the control group (infants with no genetic risk of developing dyslexia) showed a significant listening preference for the grammatical passages, whereas the dyslexia risk group made no differentiation.

Although the research summarized above demonstrates that 18-month-old infants show sensitivity to various properties of function morphemes, it does not show that infants at this age are sensitive to finite verbal inflection. The experiments carried out by Soderstrom (2002) and Soderstrom, Juczyk and Wexler (2002) shed more light on this issue. The experiments focused on English children's sensitivity to the 3<sup>rd</sup> singular verbal inflection. The experiment was performed with two groups of infants, aged 16 and 19 months. The infants were presented with pairs of stimuli containing 3<sup>rd</sup> person singular inflection. One set of passages contained grammatical sentences such as in (1a), and the other set contained ungrammatical sentences, whereby verbs in the 3<sup>rd</sup> person were conjugated incorrectly, as in (1b). Researchers measured the amount of time infants looked in the direction of each passage.

(1) a. Grammatical passage:

*At the bakery, the boy bakes bread. The metal spoon blends the flour and water together. Then the jet adds yeast and salt. In the next room, the very big machine kneads the dough. The next one forms the loaf for the oven. Quickly, the room begins to smell great.*

## b. Ungrammatical passage:

*At the bakery, the boy bake bread. The metal spoon blend the flour and water together. Then the jet add yeast and salt. In the next room, the very big machine knead the dough. The next one form the loaf for the oven. Quickly, the room begin to smell great.*

This study showed that 19-month-old infants listened significantly longer to the grammatical passages, whereas there was no significant difference with the 16-month-olds (although the difference was in the same direction as the 19-month-olds). However, as pointed out by Soderstrom et al. (2002), based on these findings alone, it is not clear whether infants preference was based on their sensitivity to verbal inflection or whether they simply preferred the more acoustically salient sound of the *-s* morpheme. One argument against the later interpretation is that the 16-month-olds did not discriminate between the passages. If infants simply preferred the more salient sound, one would not expect a difference between the two age groups. Instead, it is likely that this trend reflects infants' increasing grammatical knowledge over time (Soderstrom, 2002).

Overall, this result suggests that 19-month-old children learning English are sensitive to verbal inflection. However, this does not answer the questions posed here in their entirety. There are two reasons to conduct a similar study with Dutch children: First of all, cross-linguistic comparisons are necessary in order to address the question of universality. Second, the English verbal paradigm in the present tense is very limited because the only overtly marked form is the 3<sup>rd</sup> person singular (*-s*). All other forms in the paradigm have no overt marking. It is thus difficult to discern precisely how knowledgeable infants are in this domain. The Dutch paradigm is better to test their knowledge since it is richer and contains more contrastive forms. This should make it easier to detect whether infants discriminate in terms of phonology or grammar (for details about the verbal paradigm itself, see Chapter 3).

In sum, the literature overview shows that infants are sensitive to different properties of function morphemes. Research has demonstrated that, around the age of 18 months, infants develop sensitivity to various morphosyntactic dependencies. In the following paragraphs, I will discuss the Dutch perception experiment, which explores 18- to 19-month-old infants' sensitivity to finite inflection.

## 5.2 Hypothesis and linguistic variables

Based on my interpretation of VEKI, children have full knowledge of agreement inflection at the age of 18 months. Thus, I expect that 18- and 19-month-old Dutch infants will detect violations of finite verbal inflection. That is, they are expected to differentiate between grammatical and ungrammatical passages.

The current experiment tests an inflectional contrast between 3SG (stem + *-t*) and 3PL (stem + *-en*). Error analyses of verbal inflection (Blom and Polišenská, 2006) show that, at no age, do children overgeneralize the *-en* suffix in singular contexts (see fictive examples in [2]).

(2)	a.	overuse of <i>-en</i> in 1SG	<i>ik pakken die</i> 'I take this one'
	b.	overuse of <i>-en</i> in 2SG	<i>jij drinken sap</i> 'you drink juice'
	c.	overuse of <i>-en</i> in 2SG-INV	<i>wat drinken jij?</i> 'what drink you?'
	d.	overuse of <i>-en</i> in 3SG	<i>auto rijden hard</i> 'car ride fast'

Overgeneralizations of the *-t* suffix, however, were attested in 3PL, 1SG and in 2SG-INV contexts. Dutch children thus produce utterances such as those illustrated in (3) (personal diary data).

(3)	a.	overuse of <i>-t</i> in 1SG	<i>ik gaat lezen</i> 'I go read' (Anna, 2;8)
	b.	overuse of <i>-t</i> in 2SG-INV	<i>wat maakt jij?</i> 'what make you?' (Ties, 3;3)

- |    |                        |                                                             |
|----|------------------------|-------------------------------------------------------------|
| c. | overuse of $-t$ in 3PL | <i>poppen slaapt nu</i><br>'dolls sleep now'<br>(Aron, 2;4) |
|----|------------------------|-------------------------------------------------------------|

Children also overgeneralize the  $-\emptyset$  suffix in 3SG and 3PL as well as in 2SG. In addition, they sometimes produce utterances such as in (4) (personal diary data).

- |        |                                |                                                                  |
|--------|--------------------------------|------------------------------------------------------------------|
| (4) a. | overuse of $-\emptyset$ in 2SG | <i>jij maak een rondje</i><br>'you make a circle'<br>(Tara, 3;6) |
|--------|--------------------------------|------------------------------------------------------------------|

- |    |                                |                                                                            |
|----|--------------------------------|----------------------------------------------------------------------------|
| b. | overuse of $-\emptyset$ in 3SG | <i>het meisje lees een boek</i><br>'the girl read a book'<br>(Eladio, 3;5) |
|----|--------------------------------|----------------------------------------------------------------------------|

- |    |                                |                                                                       |
|----|--------------------------------|-----------------------------------------------------------------------|
| c. | overuse of $-\emptyset$ in 3PL | <i>kinderen drink water</i><br>'children drink water'<br>(Laila, 3;3) |
|----|--------------------------------|-----------------------------------------------------------------------|

As discussed in Section 5.1, it is important that the experiment contains control conditions in order to disentangle grammatical from phonological preferences. Table 5.1 illustrates the four types of stimuli that were included in the experiment: one grammatical singular, one grammatical plural, one ungrammatical singular, and one ungrammatical plural. This design allowed for four comparisons: one comparison between passages containing the  $-t$  morpheme versus passages containing  $-en$  morpheme (i.e. the grey versus the white cells in Table 5.1) and three comparisons between grammatical and ungrammatical passages: (1) grammatical 3SG/PL vs. ungrammatical 3SG/PL; (2) grammatical 3SG vs. ungrammatical 3SG; and (3) grammatical 3PL vs. ungrammatical 3PL.



Table 5.1: Experiment conditions

Condition type	Example
Grammatical 3SG	<i>De wind waait door het bos.</i> 'The wind blows through the forest.'
Ungrammatical 3SG	<i>*De wind waaien door het bos.</i> 'The wind blow through the forest.'
Grammatical 3PL	<i>De liedjes klinken mooi.</i> 'The songs sound beautiful.'
Ungrammatical 3PL	<i>*De liedjes klinkt mooi.</i> 'The songs sounds beautiful.'

The four conditions allowed me to determine whether infants had knowledge of inflection or whether they had a phonological preference. If infants discriminate grammatical sentences from ungrammatical sentences, one would predict a difference in mean listening times between grammatical and ungrammatical passages. If, however, infants discriminate the sentences via phonological differences, one would predict that infants would discriminate between the *-en* and *-t* morphemes, regardless of whether or not it occurs in a grammatical or ungrammatical passage.

### 5.3 Method

The design of the current experiment closely followed the design used in infant perception studies discussed in 5.1. This section consists of five subsections,

which describe the method of the current experiment: participants (5.3.1), stimuli (5.3.2), apparatus (5.3.3), procedure (5.3.4) and data analysis (5.3.5).

### 5.3.1 Participants

The data were from 29, typically developing, Dutch infants between 18 and 19 months (twenty 18-month-olds and nine 19-month-olds; 15 boys and 14 girls). 18 additional infants participated in the study but their data were discarded due to crying (5), fussy behavior (9), average listening times less than two seconds (2) and ceiling listening times (2). The subject-loss falls within the expected range (15 – 50%), which has been reported in other perception studies with infants of the same age (e.g. Hirsh-Pasek and Golinkoff, 1996; Wilsenach, 2006; Soderstrom, 2002). Before infants were invited to participate in the experiment, parents either completed a brief written survey or telephone survey to determine their eligibility for participation in the study. All infants were growing up in a monolingual, Dutch-speaking environment. All were full term, healthy infants whose parents reported no particular problems or delays with regard to cognitive, language, or motor development throughout infancy. In addition, all children had normal hearing, and did not experience any out-of-the-ordinary. Infants with parents who suffered from dyslexia were excluded from the study.

It is very natural for young infants to show variable behavior during HPP experiments. In an attempt to classify infants' behavior more systematically, a behavior coding system was developed (Erkelens and Polišenská, 2007). As shown in Table 5.2, the coding system distinguished four behavior profiles, which relate to four different categories, each represented by a single color: (I) infants who sat still on the parent's lap and were alert until the experiment finished were categorized as 'green', (II) infants were categorized as 'blue' when they behaved just like the 'green' infants in the first half of the experiment, but tended to become restless towards the second half. (III) infants who were physically, very active but nevertheless paid attention to the stimuli were categorized as 'yellow' and (IV) infants who did not finish the experiment due to crying or moving from the caregiver's lap were included in the category 'red'. The crucial distinction between the 'green' and 'yellow' categories has to do with the amount of undesired behavior on behalf of the infant.

**Table 5.2: System for coding infant's behavior during a HPP experiment (Erkelens and Poliřenska, 2007)**

CATEGORY	CRITERIA
I Green  N = 20	During the entire experiment (12 trials) the infant: -sits still on the caregiver's lap -reacts spontaneously to the lights -gives the impression that she is alert and relaxed -asks caregiver's attention only by turning the head (not the whole body)
II Blue  N = 4	Throughout the first half of the experiment (6 trials) the infant: -behaves as defined in the 'green' category During the 2 <sup>nd</sup> half of the experiment, the infant shows one (or both) of the following behavior: -refuses to sit still (stands up) -gives impression of disinterest (thumb in the mouth or pacifier)/does not turn spontaneously to the light (experimenter must start the auditory stimuli in order to regain infant's attention)
III Yellow  N = 5	During the whole experiment the infant: -stays (sitting or standing) on the caregiver's lap and reacts to the stimuli BUT in between the trials she is physically active, i.e. -constantly turns to the parent (not only head but the whole body, moves the whole body from the waist up while looking around; waves with arms; shakes head)
IV Red  N = 18	Infant does not complete the experiment because (s)he: -refuses to sit still and gets off the caregiver's lap -cries and/or gives the impression that (s)he is distressed by the situation (face and body expression) -does not react to the lights  Infant finishes the experiment but shows the following behavior with respect to the listening times: -mean listening time is less than two seconds per condition. -ceiling listening time in more than five trials (half of the experiment). -combination of short and ceiling listening times in more than five trials.

Infants were excluded from the experiment if they were categorized as ‘red’ (N=18). Infants categorized as ‘green’, ‘blue’ and ‘yellow’ were included in the data analysis because they all completed the testing (N=29). Out of the 29 children included in the data-analysis, 20 were categorized as ‘green’, four as ‘blue’ and five as ‘yellow’. Decisions about assigning an infant into a specific category were taken using the criteria described in Table 5.2. In order to control for the reliability of the judgment, we performed an inter-reliability check, in which eleven infants were judged by a second experimenter. The experimenters agreed on ten of eleven of the recordings, which indicates nearly perfect reliability.

### 5.3.2 Stimuli

The experimental stimuli consisted of sixteen passages, out of which, four functioned as familiarization trials and twelve as test trials. The twelve test passages were divided into six grammatical and six ungrammatical passages. The experiment contained four conditions (motivated in Section 5.2). Each passage (i.e. trial) contained eight sentences, (thus, eight instances of verbal inflection). Altogether, the test passages contained 48 verb types. The test contained 25 frequent verbs (verbs listed in the N-CDI standardized vocabulary for Dutch children under 36 months) (Zink and Lejaegere, 2002) and 23 less frequent verbs. An example of a grammatical and an ungrammatical passage are provided in (5). The complete overview of the passages used in the experiment is listed in Appendix 5.1.

(5) a. Grammatical passage:

*Het weer blijft lekker. Het kleine meisje rent naar buiten. Mama fietst hard. De hond eet uit zijn bak. Mijn grote broer schreeuwt veel. Zijn zusje lacht hardop. De hamster piept eenzaam. Iedereen spelt graag.*

b. Ungrammatical passage:

*Het weer blijven lekker. Het kleine meisje rennen naar buiten. Mama fietsen hard. De hond eten uit zijn bak. Mijn grote broer schreeuwen veel. Zijn zusje lachen hardop. De hamster piepen eenzaam. Iedereen spelen graag.*

English translation:

*The weather stays nice. The little girl runs outside. Mummy bikes quickly. The dog eats from his bowl. My big brother shouts a lot. His sister laughs loudly. The hamster squeaks lonely. Everybody likes to play.*

In order to prevent any biases in the stimuli, the passages had to meet the following requirements. Passages were matched on syllable length, however, passages with verbs suffixed by *-en*, i.e. the grammatical 3PL and the ungrammatical 3SG, logically contained eight more syllables than their counterparts (one syllable per sentence), i.e. passages with verbs suffixed by *-t*. It is necessary to mention that there are two plural suffixes in Dutch: *-en* and *-s*. In order to keep the category of nouns and verbs morphologically distinct, all nominal plural subjects in the passages were suffixed by *-s*. The passages never included finite verbs that began with *-s* or *-z* such as *slapen* ‘sleep’ or *zingen* ‘sing’. This restriction was included because it leads to ambiguity in perception: the initial phonemes *-s* and *-z* in the finite verb disguise the number of the subject. To illustrate this, consider an ungrammatical sentence *\*vader zingen elke ochtend* ‘father sing every morning’. In (6a), the subject might be perceived as singular and the sentence as 3SG ungrammatical. However, in (6b), one might perceive the subject as plural (suffixed by *-s*), in which case the sentence would be grammatical.

(6) a. **PERCEPTION 1:** 3SG ungrammatical

*\*vader zingen elke ochtend*  
 ‘father –3SG sing –3PL every morning’

b. **PERCEPTION 2:** 3PL grammatical

*vaders zingen elke ochtend*  
 ‘fathers –3PL sing –3PL every morning’

Finally, none of the passages contained pronominal subjects. The female 3<sup>rd</sup> person singular pronoun *zij* ‘she’ and the 3<sup>rd</sup> plural personal pronoun *zij* ‘they’ are homonymous, which also leads to ambiguous perception of grammaticality. This is illustrated in (7).

- (7) a. **PERCEPTION 1:** 3SG grammatical  
*zij danst op het strand*  
 ‘she -3SG dances -3SG on the beach’
- b. **PERCEPTION 2:** 3PL ungrammatical  
*\*zij danst op het strand*  
 ‘they -3PL dances -3SG on the beach’

The passages were audio-recorded in a sound-proof studio. A female native speaker of Standard Dutch was instructed to read the sentences as naturally as possible, so that the stimuli were representative of the infants’ daily input. The grammatical and ungrammatical sentences were read using identical intonation. After the recording, the sentences were judged by two persons for overall similarity of the grammatical and the ungrammatical sentences. If one of the two judges was unsatisfied, the passage was re-recorded. The sound files were digitized in the computer at a sampling rate of 16kHz and were edited using PRAAT software (Boersma, 2001). The passages varied in length from 21 to 26 seconds.

### 5.3.3 Apparatus

The experiment took place in a three-sided booth constructed according to the specifications described in Santelmannn and Jusczyk (1998). As illustrated in Figure 5.1, the testing booth was constructed out of three panels set at right angles with each other. A green light was mounted on the central panel. Below the green light, there was a small hole for the lens of a video camera that recorded each session. A red light was mounted on each side-panel and a loudspeaker, through which the audio signal was played, was mounted behind each of the side-panels of the testing booth.

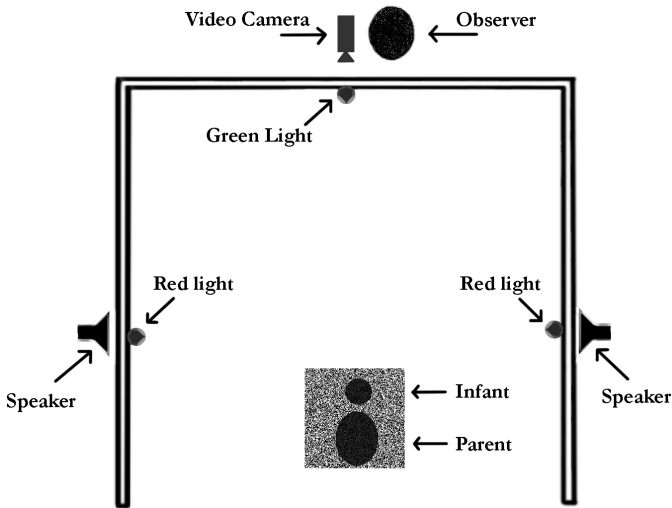


Figure 5.1: Test booth for Preferential Listening Procedure viewed from above. The infant is seated on the caregiver's lap and facing the central panel with the green light. Source: Kemler Nelson et al. (1995)

The experiment consisted of four familiarization trials and twelve test trials. The familiarization trials preceded the test trials and acquainted the infants with the stimuli and working of the lights. During the familiarization phase, all infants heard the same set of stimuli (two grammatical and two ungrammatical passages) in the same order. During the test phase, each infant heard both kinds of stimuli from both sides of the test booth. The test trials were presented randomly. Computer software determined the limits of the randomization: The maximum number of successive same type trials and the maximum number of successive same side trials were both set at two. This was because I did not want the infants to get habituated to the same type of stimuli and develop a preference for either the right or the left side. All infants were seen for a single experimental session.

### 5.3.4 Procedure

The infants came with their parent(s) to the laboratory, where they were first allowed to play with some toys. While the infant played, the experimenter explained the experimental procedure to the parent and took a short interview. After this intake interview, an experimenter verified the information obtained about the child through the web form or the first phone contact (see Section 5.3.1). Whenever relevant, information concerning the physical and/or emotional condition of the child on the day of testing was added. After the intake, the parent and the child were seated in the test booth opposite to the green light as depicted in Figure 5.1. For the successful course of the experiment, the experimenter instructed the parent to sit on a chair facing forward with uncrossed legs and to keep his or her child centered on the lap and not to speak to the child during the experiment. When the infant asked for attention, the parent was permitted to respond by smiling or stroking. The experimenter then darkened the testing booth and started the experiment. Each trial began with the blinking of a green light on the front wall, in order to draw the infant's attention to the centre. When the infant's attention was centered, the green light stopped blinking and the red light on one of the two side panels started blinking, indicating the availability of an auditory stimulus on that side. Once the infant made a head turn to that side, the auditory stimulus began to play. The stimulus continued and the red light kept blinking until the infant turned away for a continuous period of two seconds or until the entire stimulus for that trial had been played.

The infant's looking behavior was monitored on a television. A button-box was used to begin the experiment and score the infant's looking behavior. The button-box had two buttons, one black and one red. The experimenter started every experiment by pressing the black button. This resulted in the blinking of the green light. Once the infant's attention was centered, the experimenter pressed the black button a second time. This resulted in a blinking red light on one of the sidewalls of the booth. When the infant made a head-turn to that direction, the experimenter pressed the black button for the third time and the auditory stimulus started playing. This marked the beginning of the infants listening time. When the infant turned away from the stimulus, the experimenter pressed the red button. This response stopped the computer timer, however the auditory stimulus continued to play. If the infant turned back to the auditory stimulus, the experimenter again pressed the black button.



With this response, the timer continued counting from where it last stopped. However, if the infant failed to look back to the auditory stimulus within two seconds, the computer was programmed to stop the sound and the light. The experimenter initiated the next trial by pressing the black button, which, once again activated the green light.

The procedure was repeated for each new trial. Both the parent and the observer listened to masking music over headphones to prevent them from influencing their infants' behavior. The computer accumulated the total looking time towards each test passage. Immediately after the experiment was completed, the parent was invited to see the video recording of the experimental session and to ask any questions regarding the study and the experiment.

### 5.3.5 Data analysis

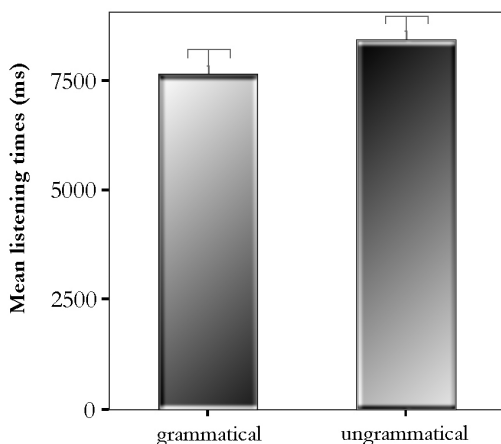
Computer software created an online data file for each of the participating infants. This online data file contained information about the progress of the experiment (i.e. amount of time an infant was orientated to the sound source while a stimulus played, the direction from which the stimulus was played and the order in which the stimuli was presented). A SONY DVD recorder was used to provide a permanent record of the test sessions, which permitted us to carry out reliability checks. All recordings were first scored online and then (after the infant's visit), they were scored off-line. In order to ensure reliability, the off-line scoring was done by a second experimenter. The off-line experimenter scored the videotapes with the sound turned off using the same response box as the on-line experimenter. The computer program GATHER<sup>7</sup> was created in order to compare the online and off line scored files and to calculate the (mean) listening times per condition. Reliability in judging the timing of the head-turn for 29 infants was 0.91 on the scale of Alpha. Comparable results were reported by Gerken, Juszyk and Mandel (1994) for the inter-observer agreement. For the data-analysis I used the online scored recordings unless the online file contained an error such as the button was pressed unintentionally during the live observation. In this case, the online file was replaced by a corrected off-line file and included in the data-analysis.

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<sup>7</sup> I am grateful to Alexander Kaiser who developed GATHER for the purpose of this study.

## 5.4 Results

Means and standard errors of listening times for overall grammatical discrimination, i.e. between grammatical 3SG/3PL and ungrammatical 3SG/3PL passages, are presented in Figure 5.2. The mean listening time was 7.6 seconds for the grammatical passages and 8.4 seconds for the ungrammatical passages across all infants. The paired difference between the mean listening times was 0.8 seconds. The difference is not significant:  $t(28) = -1.387$ ,  $p = .17$ , which means that, in this condition, the infants showed no listening preference for either grammatical or ungrammatical passages.



**Figure 5.2: Mean listening times for grammatical and ungrammatical passages in both 3SG and 3PL conditions.**

Similarly, a paired t-test revealed no significant difference in mean listening times with respect to phonological discrimination between the *-t* and the *-en* suffix. The mean listening time across all infants in conditions where the verb was suffixed by *-t* (i.e. grammatical 3SG and ungrammatical 3PL) was 7.6 seconds whereas, in conditions where the verb was suffixed by *-en* (i.e. grammatical 3PL and ungrammatical 3SG), the mean listening time was 8.4 seconds. The paired difference between the mean listening time was 0.8 seconds (see Figure 5.3). The infants showed no preference in terms of phonological contrasts.

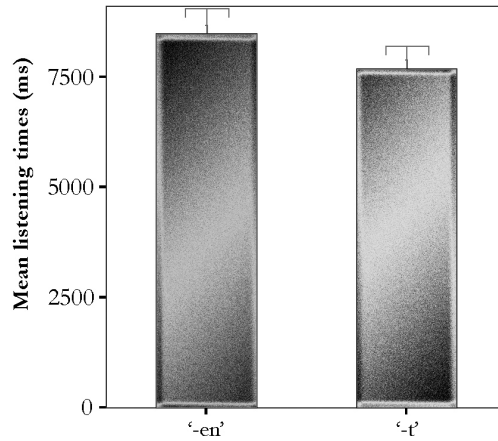
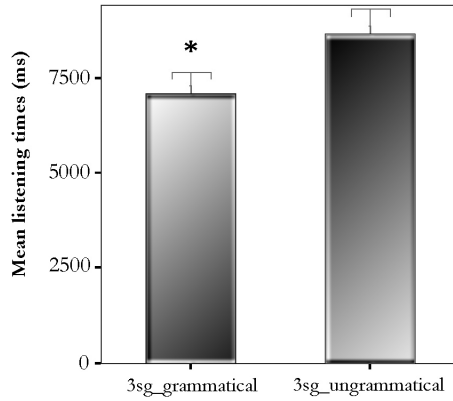


Figure 5.3: Mean listening times for passages containing *-en* and *-t* morpheme.

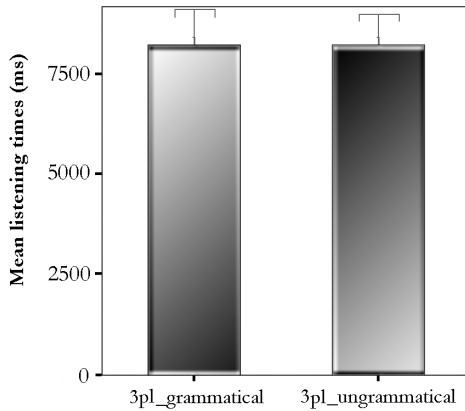
Thus far, there is no evidence that Dutch infants differentiate grammatical from ungrammatical sentences. Nor is there any evidence that they prefer one phonological form over the other. To verify whether this finding applied in both the singular and plural conditions, another analysis was carried out which looked into the constructions individually.

As illustrated in Figure 5.4, infants did have a form preference in the 3SG condition. Specifically, the infants listened significantly longer to the ungrammatical passages. The mean listening time across all infants in 3SG was 7.1 seconds for grammatical passages and 8.6 seconds for ungrammatical passages. The paired difference between the mean listening times was 1.5 seconds. This difference is significant:  $t(28) = 2.151$ ,  $p < .05$ . Of the 29 infants in this condition, 19 listened longer to ungrammatical passages.



**Figure 5.4: Mean listening times for grammatical and ungrammatical passages in 3SG.**

In 3PL, infants showed no listening preference for grammatical or ungrammatical passages (see Figure 5.5). The mean listening time across all infants was 8.2 seconds for grammatical passages and 8.2 seconds for ungrammatical passages. The paired difference between the mean listening times was 0.0 seconds, which, needless to say, did not reveal any significant difference:  $t(19) = 0.005$ ,  $p = .99$ .

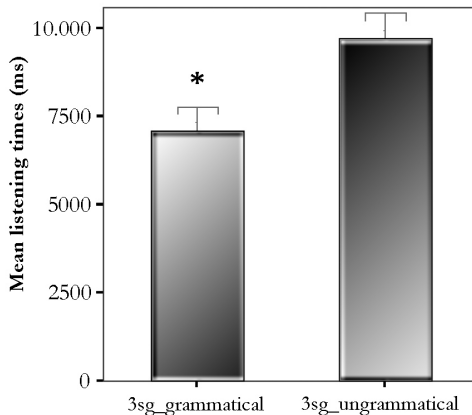


**Figure 5.5: Mean listening times for grammatical and ungrammatical passages in 3PL.**

The results demonstrate that Dutch infants at 18 and 19 months differentiate between grammatical and ungrammatical passages in 3SG. There was no evidence, however, that infants are sensitive to subject-verb agreement violations in 3PL.

Recall from Section 5.3.1, that the results reported above are based on data from infants with three different behavior profiles (labeled ‘green’, ‘blue’ and ‘yellow’ in Table 5.2). The main criterion for including infants in these three categories was that they completed the testing. It is possible, however, that differences in infants’ behavior during testing might have influenced the outcome of the experiment. In order to examine whether this was the case, a follow-up analysis was carried out with data from the infants who were placed in the green category. This specific group of infants matched the requirements of the HPP experimental setting the best: The infants sat still on the caregiver’s lap, reacted adequately to the lights and finished the experiment without any signs of fatigue or boredom. It is thus, possible that the data from these particular children is more valid than data from the other children.

This analysis included data from 20 infants. Means and standard errors of listening times in 3SG are shown in Figure 5.6. For the ‘green’ infants, the mean listening time was 7.0 seconds for the grammatical passages and 9.7 seconds for the ungrammatical passages. The paired difference between the mean listening times was 1.7 seconds, which reaches significance  $t(19) = 3.684$ ,  $p < .005$ . Of the 20 infants in this condition, 15 preferred the ungrammatical passages.



**Figure 5.6: Mean listening times for grammatical and ungrammatical passages in 3SG (the ‘green’ infant group)**

When I compare the results of the ‘green’ infants with the results from infants in all three categories combined, it becomes clear that there are differences between the groups. Although both groups demonstrated a significant difference for looking times between grammatical and ungrammatical passages, for the 3<sup>rd</sup> person singular, it should be noted that the p-value is much higher for the ‘green’ infants than for the mixed group ( $p < .005$  and  $p < .05$ , respectfully).

I also performed additional analyses on the other conditions in order to test whether the ‘green’ infants might perform differently when their data are combined with children in the other behavior profiles. Results from all other tests, however, did not differ from the original tests which included the three groups of infants.

## 5.5 Interpretation of the results

The goal of the preceding experiment was to determine whether 18- and 19-month-old infants acquiring Dutch are able to detect violations in finite verbal inflection. Production data suggests that Dutch children at three years are quite accurate with finite verbal inflection. The results of the experiment demonstrate that Dutch infants develop sensitivity to verbal inflection much earlier, by around 18 months. Moreover, the experiment furthers our understanding of what young children know about inflection by offering insight into a language other than English, which, as mentioned earlier, does not have a very rich verbal paradigm, and thus, is not an ideal language to study agreement inflection.

In my perception experiment, the infants were tested in four different conditions. Doing so made it possible to determine whether infants discriminated on the basis of grammaticality or phonology. I predicted that if infants discriminate on the basis of grammaticality, then they would listen significantly longer to either the grammatical or ungrammatical passages. If, however, they discriminate on the basis of phonology, then one would expect a significant difference in the listening times between passages containing different suffixes, i.e. between passages where the verb is suffixed by *-t* and passages where the verb is suffixed by *-en*. Our findings did not support the hypothesis that infants discriminate on the basis of phonological patterns: Dutch infants did not prefer to listen to the passages with *-t*, nor did they prefer the passages with *-en*.

When all four experimental conditions were analyzed together, the experiment did not provide evidence that infants detect agreement violations. However, when the analysis focused on singular and plural conditions separately, I found that Dutch infants differentiated between grammatical and ungrammatical passages in 3SG whereas they did not in 3PL. This means that infants discriminated between the *-t* and the *-en* suffixes in (8) but they did not discriminate between the *-t* and the *-en* suffixes in (9). As such, the fact that infants did not show a difference in their listening behavior in 3PL cannot be ascribed to the experiment. As reported in previous sections, the experiment contained both 3SG and 3PL grammatical and ungrammatical conditions which were presented in a pseudo-randomized order.

(8) *De wind waait door het bos.*  
 ‘The wind blows through the forest’

*\*De wind waaien door het bos.*  
 ‘The wind blow through the forest’

(9) *De liedjes klinken mooi.*  
 ‘The songs sound nice’

*\*De liedjes klinkt mooi.*  
 ‘The songs sounds nice’

The findings obtained from the perception experiment are consistent with the findings obtained from the elicited production experiment. The error-analysis in 4.6.4 indicates that Dutch children do not overuse the plural *-en* suffix in subject-verb-object utterances with singular subjects. In the current perception experiment, Dutch infants detected this agreement error. That is, they discriminated grammatical sentences from ungrammatical sentences in 3SG (for example, see [8]). The error analysis on the plural context also revealed that children sometimes substituted the *-t* suffix in 3PL. In the perception experiment, infants appeared to ignore this agreement error: Their listening times did not differ when listening to sentences in 3PL (as in [9]). In accordance with this result, Leonard et al. (2002) reported that, before the age of three, Italian children replace 3PL with 3SG. Children, however do not do the reverse.

Both the findings from the perception experiment and from the production experiment suggest that Dutch children's early grammars do not allow for the use of the *-en* suffix in the singular context. However, they do allow for the use of the *-t* suffix in the plural. Further research is needed, however, to verify whether or not 18- to 19-month-old infants can detect agreement violations in other inflectional contexts within the Dutch verbal paradigm. More specifically, it needs to be established whether or not infants at this age can discriminate between *-t* and *-ø* as well as between *-ø* and *-en* finite suffixes.

One of the aims of the experiment was to test the claim that children have early knowledge of inflection. The outcome of my experiment shows that the infants' sensitivity to finite verbal inflection is not fully developed at 18 months. Whereas the infants showed sensitivity to agreement violations in 3SG, they did not detect the agreement violations in 3PL. Thus, whereas the Dutch infants seemed to be aware of the restricted use of the *-en* suffix, they did not show any awareness of the limited use of the suffix *-t*. VEKI, which is interpreted to claim that children have full knowledge of agreement inflection at the age of 18 months, is therefore not supported by the perception data of Dutch infants.

On the basis of the form-feature specification for verbal inflection presented in Chapter 3, and repeated here in (10) for convenience, I can conclude that, within the set of finite morphemes, the *-en* suffix is mapped earlier to its corresponding features than the *-t* suffix. By implication, the infants know the constraints on the *-en* earlier than those on the *-t* suffix.

(10)	/t/	↔	[+FINITE;-SPEAKER;-PLURAL]
	/en/	↔	[+FINITE;+PLURAL]
	/ø/	↔	[+FINITE]
	/en/	↔	[-FINITE]

Furthermore, the experiment supports the claim that *-en* has two feature representations in Dutch (Haeseryn et al., 1997; Aalberse, 2009): The experiment shows that infants are sensitive to subject-verb agreement violations when a singular subject is followed by a verb in a *-en* form. Given the feature representation in which the *-en* suffix is completely underspecified and is considered the default (Wexler et al., 2004; Bennis and MacLean, 2006), a different outcome would be expected: In case of *-en* underspecification, children's grammar would allow for *-en* with the singular subject, resulting in no differences in listening behavior.



To what extent can the observations be explained by salience factors? With respect to finite morphemes, I predicted that there would be no considerable variation in children's acquisition. However, it turned out that variation occurs: 18- and 19-month-old infants were sensitive to agreement violations when *-en* followed the singular subject but not when *-t* followed the plural subject. In Chapter 3, I already explained why the method for calculating salience should be taken with caution when no developmental variation is predicted. I stated that, if my observations were not compatible with the predictions, it would not be possible to refute the claim that salience plays a role in the acquisition of inflection. Instead, it would be necessary to reconsider the initial assumption: that all salience factors have equal weight. It is possible, for example, that some factors are weighted heavier than others. In order to gain insight into the actual weights of the factors, I compare the results from the perception experiment within the individual factors.

In Chapter 3, I presented an overview of form-feature pairs within the verbal paradigm and the scores that they received for each salience factor. This overview is repeated here in Table 5.3.

**Table 5.3: Overview of scores assigned within each salience factor in Dutch verbal inflection.**

Form – Feature pair	Phonological salience	Positional salience	Feature salience	Feature complexity	Input frequency	SUM
<i>-t</i> [+FIN; -SP; -PL]	3	3	3	2	3	14
<i>-en</i> [+FIN; +PL]	4	3	2	3	2	14
<i>-∅</i> [+FIN]	2	3	3	4	2	14
<i>-en</i> [-FIN]	4	4	4	4	4	20

The result of the experiment is consistent with predictions yielded by phonological salience and feature complexity. The results are inconsistent with predictions made by feature salience and input frequency, since these factors predict that the *-t* suffix is more salient than the *-en* suffix, and thus, would be expected to be acquired earlier. It should be noted, however, that the interpretation of the outcome is highly dependent on the form-feature specification in (10). I will return to this in more detail in the final chapter.

## 5.6 Note on HPP and the listening preference

The findings of the present experiment are consistent with findings reported by Soderstrom (2002) and Soderstrom et al. (2002) because the English-acquiring infants also showed sensitivity to verbal inflection in similar contexts. However, whereas the English infants listened longer to the grammatical passages, the Dutch infants listened longer to the ungrammatical passages. Regardless of the direction, it is clear that 18- and 19-month-old learners of English- and Dutch are able to discriminate between grammatical and ungrammatical sentences. Similar reversals in preference have been reported in other studies using HPP (e.g. Gomez and Maye, 2005; Soderstrom and Morgan, 2007). As mentioned before, the main objective of the HPP is to establish whether infants discriminate between two incoming stimuli. This shows that they are sensitive to a certain (linguistic) stimulus. The direction of the preference is secondary to the discrimination. It has been suggested that the direction of listening preference is likely to be influenced by various factors such as age, length of experiment and/or the complexity of the stimuli (Hunter and Ames, 1988). However, since the design of our experiment matched Soderstrom's design with respect to age and length of the experiment, these factors cannot account for the reverse preference. A closer look at the linguistic phenomenon verified in the experiments, however, may shed a light on this apparent cross-linguistic difference.

While the present study examined whether or not there is variation in the development of finite morphemes, Soderstrom et al's (2002) study focused on the optional infinitive stage in English speaking infants. In this stage, infinitival verbs optionally appear in finite matrix clauses where target grammars require finite (i.e. agreement- and/or tense-marked) verbs. Production data show that English children do not view the 3<sup>rd</sup> person singular as obligatory until at least three years (Harris and Wexler, 1996; Gülzow, 2003). In this respect, the infinitival form in 3<sup>rd</sup> person singular may, in fact, be a well-formed sentence for 18 and 19-months old English infants. Similarly, the fact that overuse of the *-en* in the singular context does not seem to be allowed in Dutch children's grammar may influence Dutch infants' attention: The *-en* in the 3SG may sound more awkward to the Dutch infants than the *-ø* to the English infants. Moreover, as I already mentioned in Section 5.1, it is possible that the distinct acoustic properties of the suffix *-s* may cause an attentional bias in infants acquiring English.

## 5.7 Conclusion

The findings obtained in the perception experiment demonstrate that 18- and 19-month old infants are developing sensitivity to finite verbal inflection. The detection of grammatical violations is limited to the 3<sup>rd</sup> person singular, suggesting that, at this age, infants still do not have full knowledge of verbal inflection. Consequently, the findings do not support the empirical generalization based on VEKI, which states that children have full knowledge of agreement inflection at the age of 18 months. Based on the form-feature specification in (10), the findings are not compatible with the predictions yielded by salience, namely that there would be no variation regarding the development of the finite morphemes. Comparison of the findings with the predictions yielded by individual salience factors suggested that infants' attention was drawn to a finite morpheme, which scored relatively high on phonological salience and feature complexity, and relatively low on feature salience and input frequency. Finally, the pattern obtained in the perception experiment provided further support for the claim that, in the Dutch system of verbal inflection, the *-en* suffix has two underlying representations.



# 6

## Production of attributive adjectival inflection

The previous two chapters focused on developmental variation in Dutch verbal inflection. The elicited production data showed that the acquisition of verbal inflection was completed by the time children were three years old. The perception data on 18 to 19-month-old infants suggested that there is variation in the order of acquisition, and that not all finite verbal morphemes were acquired at 18 to 19 months. In this respect, the data are not consistent with the claim that children have full knowledge of inflection from early development. Given that this claim is not limited to verbal inflection, it is also necessary to examine acquisition of inflection outside the verbal domain. Dutch adjectival inflection has an agreement system that is less salient than the verbal system. Accordingly, it is possible that it is more difficult for children to acquire. In this chapter, I will report on an empirical investigation of Dutch children's acquisition of attributive adjectival inflection, which is based on elicited production data. The chapter is organized as follows: Section 6.1 through Section 6.5 provide details on the method used in the study. Section 6.6 presents the results on Dutch children's use of attributive adjectival inflection. Section 6.7 presents an interpretation of the findings and finally, Section 6.8 concludes the chapter.

### 6.1 Participants

The participants in the adjectival inflection study were 85 monolingual Dutch children between three and eight years old. The children lived in the central western part of the Netherlands and spoke the standard variety of Dutch. Most of the children in the three-, four- and the five-year-old group participated in the empirical investigation of finite verbal inflection as reported in Chapter 4. More information about the selection criteria including information about their typical course of development and their socio-economic status can be found in Chapter 4, Section 4.1.

The lower age boundary of three years was chosen in order to ensure that children were able to participate in the elicitation task (see also Weerman et al., 2006 for the same motivation). In addition, I wanted to ensure that children were able to productively use Determiner Phrases that consisted of a *determiner-adjective-noun* combination, which, according to the literature, happens at around three years (Bol and Kuiken, 1988; Rozendaal, 2008). In Chapter 3, I mentioned that grammatical gender is crucial in the acquisition of adjectival inflection. Given the observation that six-year-old Dutch children still tend to overuse common grammatical gender in the definite determiners (e.g. Deutsch and Wijnen, 1985; Van der Velde, 2003), I selected children up to the age of eight years, assuming that, at this age, the use of grammatical gender would be in accordance with the target language.

In line with the cross-sectional design, with age as an independent variable, I divided the children into six age groups. Table 6.1 provides information about the number of participants in each group, the mean ages of the groups, and their standard deviations.

**Table 6.1: Overview of the participants**

Age group (yrs)	N of participants			Mean age (yr; mos)	SD age
	Boys	Girls	Total		
3	3	4	7	3;06	0.02
4	8	9	17	4;05	0.04
5	3	12	15	5;05	0.03
6	9	7	16	6;06	0.02
7	11	5	16	7;06	0.03
8	6	8	14	8;06	0.04

As can be seen in Table 6.1, the number of boys and girls was not always equal. The figures reflect a convenience sample based on the distribution of boys and girls who were in the class at the moment of testing. Given that there is no indication that sex influences acquisition of grammatical morphemes, the unequal distribution of sexes is not considered as a potential source of bias.

## 6.2 Data collection

Details concerning data collection can also be found in Chapter 4, Section 4.2. A graduate student transcribed all responses orthographically from an audio recording to a scoring sheet (see Appendix 6.1). In order to assess reliability, ten randomly drawn recordings were transcribed by a second transcriber and the inter-rater reliability was calculated. The percent of agreement between the transcriptions for the children's responses was 95%.

## 6.3 Test conditions and test items

Based on Weerman et al's (2006) pilot study, children at three years are target-like in their production of non-attributive adjectives. Consequently, this experiment focused solely on children's production of attributive adjectives. Given that the aim of the study was to assess the knowledge of inflectional rules, it was necessary to control for the complete set of feature contrasts in attributive adjectival inflection (for details see Chapter 3, Section 3.1). This was accomplished by including eight test conditions in the adjectival inflection test, as listed in Table 6.2.

**Table 6.2: Conditions in attributive adjectival inflection test**

Condition	Example
Definite common singular	<i>De rode auto</i> 'the red car'
Indefinite common singular	<i>Een rode auto</i> 'a red car'
Definite neuter singular	<i>Het rode huis</i> 'the red house'
Indefinite neuter singular	<i>Een rood huis</i> 'a red house'
Definite plural	<i>De rode auto's</i> 'the red cars'
Indefinite plural	<i>Rode huizen</i> 'red houses'
Definite neuter diminutive singular	<i>Het rode huisje</i> 'the little red house'
Indefinite neuter diminutive singular	<i>Een rood huisje</i> 'a little red house'

Children's knowledge of adjectival inflection rules could not be accurately assessed without first assessing how children classify nouns with respect to grammatical gender. Since the form of the determiner is dependent on grammatical gender, it serves a good way to investigate which gender children attribute to each particular noun on the test. A gender attribution test was therefore included which assessed children's use of definite determiners with common and neuter nouns. The test elicited children's production of definite determiners for each of the nouns used in the adjectival test. In addition, I also looked into children's determiner production in the actual adjectival test, since it too, elicited the use of a definite determiner. Thus, in total, children's attribution of gender was based on their production of three definite determiners: two from the gender attribution test, and one from the definite, singular condition in the adjectival inflection test (see Table 6.2).

Ten root nouns were employed as test items: Five common gender nouns and five neuter gender nouns. To ensure that all participants would be familiar with the words, the nouns were taken from the standardized vocabulary list for Dutch children under the age of three (N-CDI, Zink and Lejaegere, 2002).

In addition, five diminutive nouns were included in the study. The reason for including diminutives was that they are morphophonologically marked for neuter gender by the derivational suffix *-tje*.<sup>8</sup> In Chapter 2, I pointed out that grammatical gender is a conceptually non-salient morphosyntactic feature. Various studies have shown that gender categories with highly salient morphophonological cues, are acquired earlier than gender categories without such cues (e.g. Karmiloff-Smith, 1979; Mills, 1986; Pérez-Pereira, 1991). Given that attributive adjectival inflection is dependent on grammatical gender, it is conceivable that the acquisition of gender in Dutch is facilitated by the presence of overt morphophonological cues. Inclusion of diminutives allowed me to test whether or not the salient gender marking played a role in children's acquisition of neuter gender in adjectival inflection.

I already mentioned that, in order to obtain relevant information about the acquisition of attributive adjectival inflection, it was crucial to elicit a particular noun in a number of contexts. Because younger children have a shorter concentration span, they were tested on a reduced number of items. Table 6.3 provides an overview of the test items. The test items in capital letters

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<sup>8</sup> In general, the morpheme *-tje* is considered the phonological base form for the diminutives (Trommelen, 1983; Kooij and Van Oostendorp, 2003 but see Huber, 2004 for an alternative view). The morpheme *-tje* has several allomorphs. The exact choice of an allomorph is determined by the phonological properties of the stem.



were used in the reduced test version with the three- to five-year-olds. The shorter version (for three to five years) contained 46 test items and the longer version (for six to eight years) contained 78 test items.

**Table 6.3: Root and diminutive nouns used as test items**

ROOT Common gender		ROOT Neuter gender		DIMINUTIVES Neuter gender	
<i>APPEL</i>	‘apple’	<i>GLAS</i>	‘glass’	<i>BOEKJE</i>	‘little book’
<i>BABY</i>	‘baby’	<i>MES</i>	‘knife’	<i>KADOOTJE</i>	‘little gift’
<i>VIS</i>	‘fish’	<i>PAARD</i>	‘horse’	<i>HUISJE</i>	‘little house’
<i>Auto</i>	‘car’	<i>Schaap</i>	‘sheep’	<i>Raampje</i>	‘little window’
<i>Schoen</i>	‘shoe’	<i>Vliegtuig</i>	‘plane’	<i>Varkentje</i>	‘little pig’
Trial items: <i>SOKJE</i> ‘little sock’ and <i>PAN</i> ‘sauce pan’					

## 6.4 Procedure and materials

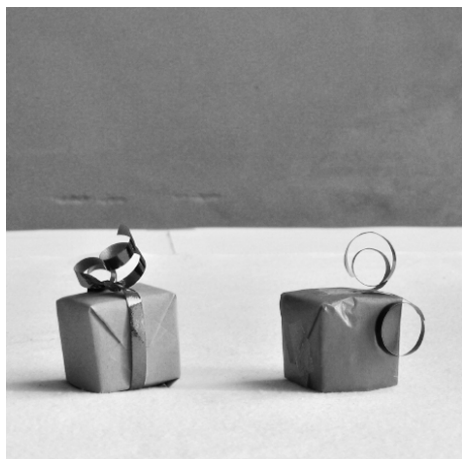
In order to assess gender attribution and knowledge of adjectival agreement, I used sentence completion tasks. As test material, I used colored photos, taken with a digital camera. The pictures were printed and ordered in a booklet in a pseudo-randomized order. Each condition was preceded by a trial item which was meant to familiarize the children with the procedure of the test. The items on the gender attribution test were used as fillers for the adjectival inflection test and vice versa. The presentation order of the items was the same for all children. The duration of the test was approximately 15-20 minutes for the younger children (three to five years) and 10-15 minutes for the older children (six to eight years).

To elicit responses on adjectival inflection, pictures were presented which included pairs of items which only differed in one respect. This way, children were forced to use an adjective in order to describe the difference between the two pictures. I used two contrastive sets of adjectives: *groot/klein* ‘big/little’ and *rood/groen* ‘red/green’. For diminutives, adjectival inflection was only tested using the ‘red/green’ set of adjectives since the diminutive inherently implies

‘little’, and would thus, be odd to use in combination with the adjective ‘big’. As is usually the case in actual discourse, the objects were introduced with an indefinite determiner. Subsequent references to the object should use a definite determiner (e.g. Gundel, Hedberg and Zacharski, 1993). This was the assumption behind the elicitation of the indefinite determiner.

The elicitation procedure of attributive adjectives in singular and plural contexts is demonstrated in (1) and (2), respectively. The experimenter triggered the sentence by pronouncing the underlined words and the participant was expected to complete the sentence (target responses required by the test are given in bold).

(1) Example of the sentence completion task for elicitation of the attributive adjectives in the singular context



Kijk twee cadeautjes.  
Dit is een groen cadeautje

‘Look, two little gifts.  
This is a little green gift.’



Konijn staat voor het groene  
cadeautje.

‘Rabbit stands in front of...the little  
green gift.’

(2) Example of the sentence completion task for elicitation of the attributive adjectives in the plural context



Kijk een heleboel cadeautjes.  
Dit zijn groene cadeautjes

‘Look, many little gifts.  
These are little green gifts.’

Ik pak de groene cadeautjes.

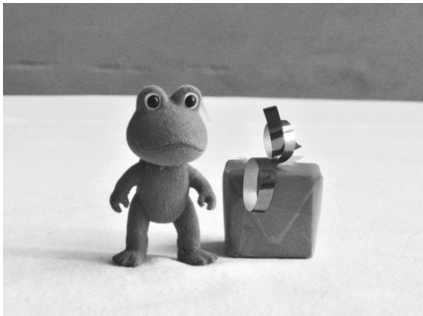
‘I take the little green gifts.’

Some children omitted the noun and provided elliptic responses such as *groene* ‘green’ or *de groene* ‘the green’, which is entirely acceptable in Dutch (Haeseryn et al., 1997). When this happened, the experimenter attempted to elicit complete responses by asking *groene wat? gras?* ‘green what? grass?’. Not surprisingly, children in older groups reacted better to this cue than children in younger groups. As a result, I obtained more elliptic responses from children in the younger groups.

As mentioned in Section 6.3, it was necessary to assess which gender children attributed to the nouns on the test (see Table 6.3). The example in (3) illustrates the procedure of the gender attribution test.

(3) Example of the sentence completion task for elicitation of the gender encoding in definite determiners

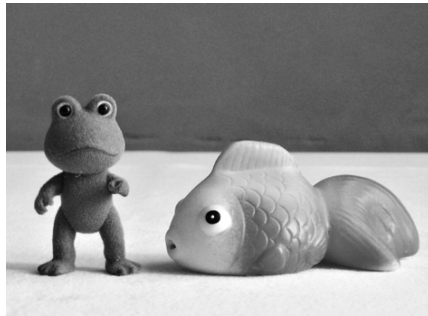
a. neuter noun in diminutive



Kijk een cadeautje. Waar is Kikker?  
Kikker staat naast het cadeautje.

‘Look, a little gift. Where is Frog?  
Frog stands next to the little gift.’

b. common root noun



Kijk een vis. Waar is Kikker?  
Kikker staat naast de vis.

‘Look, a fish. Where is Frog?  
Frog stands next to the fish.’

Contrary to what the test was meant to elicit, in some cases, children used indefinite articles instead of a definite articles to complete the sentences. In some instances, children also interpreted the images differently than what was expected. For example, some children used the noun *lammetje* ‘baby lam’ instead of the noun *schaap* ‘sheep’. In these cases, the experimenter would intervene by implicitly correcting the child’s word to the target word. While some children accepted the experimenter’s suggested word, others did not.

## 6.5 Data analysis

Children’s responses from the adjectival inflection test were assigned to one of the following four categories: (1) correct, (2) incorrect, (3) irrelevant and (4) unintelligible. (4) provides some examples of correct and incorrect responses.

- (4) a. *een groot vliegtuig* / \**een grote vliegtuig*  
a big plane
- b. *het grote vliegtuig* / \**het groot vliegtuig*  
the big plane

In some cases, children produced irrelevant responses. The category of irrelevant responses consisted predominantly of elliptic responses, as mentioned in Section 6.4.

Altogether, the data analysis consisted of three parts: The accuracy analysis, the error analysis and the consistency analysis.

The aim of the accuracy analysis was to determine the extent to which children produced correct inflection in obligatory contexts. For this analysis, I analyzed only children's correct and incorrect responses. I analyzed each test condition separately (see Table 6.2 for an overview of the test conditions).

The goal of the error analysis was to assess the types of errors that children make. The analysis focused largely on children's overgeneralizations.

The third and final analysis, the consistency analysis, was performed in order to assess children's knowledge of inflection rules. Recall from Chapter 3, the following rule: Add *-e* to attributive adjectives except when the noun is singular and has neuter gender, and the determiner is indefinite. This rule implies that the absence of inflection is a special case. The consistency analysis differed from the accuracy analysis because the consistency analysis took into consideration the gender that children attributed to the nouns by means of a definite determiner (which was determined via the gender attribution test [for details, see Sections 6.3 and 6.4]). For example, if a child incorrectly inflected the adjective in \**een grote mes* 'a big knife' (the correct form in Standard Dutch is *een groot mes*) it might have been because the child assumed that *mes* 'knife' had common gender. If so, the inflection of the adjective would have been correct, despite the use of a form which was not in accordance with Standard Dutch. In these cases, children would make a mistake in gender attribution, but their choice of the adjectival form would be in accordance with the inflectional rule. I scored children's responses as follows: If a child used the definite determiner *het* with a noun (*het paard* 'the horse'), and also used a bare adjective with the same noun: *een groot paard* 'a big horse', the child was assumed to have a consistent gender for this particular noun. The choice of *het* suggested that the child classified the noun 'horse' as neuter gender, while the use of the bare adjective (i.e. the *-ø* suffix) was consistent with this classification. Conversely, if the child would have said *het paard*, in combination with *een grote paard*, I

assumed that the child attributed gender inconsistently with this particular noun. The child's use of the definite article *bet* was inconsistent with her use of the *schwa*-inflected adjective in the indefinite condition.

## 6.6 Results

Table 6.4 gives the distributions of irrelevant and unintelligible responses across the age groups after all adjectival conditions were collapsed. Recall that the irrelevant responses category included elliptic responses, adjective omissions, and determiner and noun substitutions.

**Table 6.4: Distributions of irrelevant and unintelligible responses in adjectival inflection test**

Age group	Irrelevant		Unintelligible	
3 (N= 7)	10,5%	25/238	6 %	14/238
4 (N=17)	10 %	60/578	1 %	7/578
5 (N=15)	6 %	30/510	2 %	10/510
6 (N=16)	10 %	91/928	1,5%	15/928
7 (N=16)	8,5%	80/928	1 %	10/928
8 (N=14)	10 %	81/812	2 %	17/812

The percentage of irrelevant responses was rather consistent across the age groups (see Table 6.4). Most of the unintelligible responses were either due to children speaking too softly, which made it impossible for the transcriber to hear, or to background noise in the audio recordings. Irrelevant and unintelligible responses were excluded from further analyses. In Sections 6.6.1

through 6.6.4, I will report on the accuracy analysis, the error analysis, children's performance with diminutives, and the consistency analysis.

### 6.6.1 Accuracy

Table 6.5 shows how accurate children in each age group were with gender in definite, singular, neuter and definite, singular, common contexts. The first row of the Table 6.5 lists the target suffix and the second row specifies the inflectional context (i.e. the test condition).

**Table 6.5: Accurate use of *-e* in definite, singular condition with neuter and common nouns.**

Suffix	<i>-e</i>		<i>-e</i>	
Condition(s)	[+DEF; -PLUR; +NEUT]		[+DEF; -PLUR; -NEUT]	
Example	<i>Het grote paard</i> The big horse		<i>De grote appel</i> The big apple	
3 (N= 7)	100 %	12/12	100 %	5/5
4 (N=17)	97,5%	40/41	100 %	35/35
5 (N=15)	92 %	34/37	97,5%	40/41
6 (N=16)	94 %	64/68	100 %	60/60
7 (N=16)	100 %	64/64	98,5%	69/70
8 (N=14)	96 %	53/55	100 %	50/50

Table 6.5 shows that children were highly accurate in using the *-e* suffix in the definite, singular condition with both neuter and common nouns, with the lowest accuracy rate at 92%.

Table 6.6 displays children's accuracy rates in the plural indefinite and definite conditions.

**Table 6.6: Accurate use of *-e* in plural indefinite and plural definite condition.**

Suffix	<i>-e</i>		<i>-e</i>	
Condition(s)	[-DEF; +PLUR]		[+DEF; +PLUR]	
Example	<i>Grote paarden/appels</i> Big horses/apples		<i>De grote paarden/appels</i> The big horses/apples	
3 (N= 7)	100 %	16/16	100 %	9/9
4 (N=17)	97 %	32/33	100 %	34/34
5 (N=15)	96 %	26/27	100 %	42/42
6 (N=16)	98 %	119/121	100 %	97/97
7 (N=16)	99 %	119/120	99 %	113/114
8 (N=14)	97 %	73/75	100 %	51/51

It is evident from Table 6.6 that the plural contexts (in both definite and indefinite constructions) did not constitute a problem for children. In fact, in the definite plural condition, children performed at ceiling level. Interestingly, the few errors that did occur were almost all made in the plural, indefinite condition with nouns bearing neuter gender.

A summary of the results for the indefinite, singular condition in common and neuter nouns is presented in Table 6.7.



**Table 6.7: Accurate use of  $-e$  and  $-\emptyset$  in indefinite, singular condition with neuter and common nouns.**

Suffix	$-e$		$-\emptyset$	
Condition(s)	[-DEF; -PLUR; -NEUT]		[-DEF; -PLUR; +NEUT]	
Example	<i>Een grote appel</i> A big apple		<i>Een groot paard</i> A big horse	
3 (N= 7)	100 %	14/14	25 %	5/20
4 (N=17)	98 %	47/48	41,5%	20/48
5 (N=15)	100 %	43/43	66 %	25/38
6 (N=16)	98,5%	72/73	52 %	40/77
7 (N=16)	100 %	75/75	62,5%	47/75
8 (N=14)	100 %	63/63	86 %	57/66

As can be seen from Table 6.7 there is a striking contrast in use of  $-e$  and  $-\emptyset$ : Whereas children were accurate in realizing the  $-e$  in the indefinite, singular (98 - 100%) they were less accurate in realizing the  $-\emptyset$ : Here, their accuracy varies from 25% for the three-year-olds to 86% for the eight-year-olds. A one-way ANOVA with age as a between-subjects variable was performed in order to assess the effect of age on accuracy. Results reflect a significant effect for age:  $F(5,49) = 3,45, p < .01$ .

### 6.6.2 Error analysis

With respect to Dutch attributive adjectival inflection, children can make two types of errors. The first error would be if a child used the  $-\emptyset$  suffix incorrectly in conditions that required the  $-e$  suffix such as *\*een groot schoen* instead of *een grote schoen* ‘a big shoe’ or *\*het groot glas* instead of *het grote glas* ‘the big glass’. In this case, the children would have overused the  $-\emptyset$  suffix. The second error

would be if a child incorrectly overused the  $-e$  morpheme in the special case (i.e. *\*een grote paard* instead of *een groot paard* ‘a big horse’. Table 6.8 provides the distributions of the two error types.

**Table 6.8: Distribution of errors in attributive adjectival inflection**

Overused suffix	$-e$		$-\emptyset$	
	%	Count	%	Count
3 (N=7)	75 %	15/20	0 %	0/56
4 (N=17)	58 %	28/48	1,5%	3/191
5 (N=15)	34 %	13/38	2,5%	5/190
6 (N=16)	48 %	37/77	2 %	8/419
7 (N=16)	37 %	28/75	0,5%	3/443
8 (N=14)	13,5%	9/66	1,5%	4/283

Table 6.8 shows that, whereas children in all age groups rarely replace the  $-e$  by the  $-\emptyset$  suffix (0 – 2,5%), they commonly overuse the  $-e$  suffix.

### 6.6.3 Adjectival inflection with diminutives

Section 6.6.1 focused on children’s accuracy with attributive adjectival inflection with root nouns. I found that realization the  $-\emptyset$  suffix was problematic for children in the indefinite, singular, neuter context (Table 6.7). This observation is consistent with studies that focused on the acquisition of grammatical gender with definite determiners. These studies reported that children as old as six years were still not target-like in their production of neuter gender (Deutsch and Wijnen, 1985; Van der Velde, 2003). These studies posit

that this delay is due to the fact that grammatical gender of Dutch root nouns is arbitrary: Dutch root nouns have no overt phonological marking which would indicate to a learner, whether the noun is of neuter or common gender (for details see Chapter 3, Section 3.1). Van Berkum (1996) mentions that, in Dutch, grammatical gender for root nouns is a part of the lexical entry and must be learned and memorized.

Here, I address whether children performed better when they had phonological cues on the noun. In particular, I focus on children's production of the  $-\emptyset$  suffix when the head noun was a diminutive. Recall that diminutives are marked by a derivational suffix  $-tje$ , which is morphophonologically salient (see also Chapter 2, Section 2.3). Importantly, diminutives always require the  $-\emptyset$  suffix in the indefinite, singular context because they always bear neuter gender. Based on the assumption that children's attention is drawn to salient morphemes, I expect that children will use the  $-\emptyset$  suffix more often with diminutives than with root nouns.

Table 6.9 presents children's accuracy rates with the  $-\emptyset$  suffix for both diminutives and root nouns.

**Table 6.9: Accurate use of  $-\emptyset$  in indefinite, singular, neuter condition with diminutives and root nouns**

Suffix	$-\emptyset$		$-\emptyset$	
Type noun	Diminutive		Root	
Example	<i>Een groen huisje</i> A little green house		<i>Een groot paard</i> A big horse	
3 (N=7)	71 %	10/14	25 %	5/20
4 (N=17)	64 %	16/25	41,5%	20/48
5 (N=15)	93 %	27/29	66 %	25/38
6 (N=16)	83 %	29/35	52 %	40/77
7 (N=16)	83 %	39/47	62,5%	47/75
8 (N=14)	95 %	41/43	86 %	57/66

Table 6.9 shows a striking contrast between the occurrence of the  $-\theta$  suffix with diminutives and the occurrence of the  $-\theta$  suffix with root nouns. Across age groups, children performed above chance level. They were more accurate with diminutives than they were with root nouns. A mixed ANOVA revealed that the difference was significant ( $F(1,71) = 23,636$ ,  $p < .001$ ). Moreover, recall from Section 6.6.1 that a significant age effect was found for the occurrence of the  $-\theta$  suffix with root nouns. In contrast, a one-way between-subjects ANOVA revealed no effect of age on children's use of the  $-\theta$  suffix with diminutives. In sum, children's use of the  $-\theta$  suffix with root nouns increased with age, while their performance with  $-\theta$  suffix with diminutives was consistently high.

With respect to the use of the  $-e$  suffix, results in Section 6.6.1 showed that children were highly accurate with root nouns. In order to detect whether children demonstrated the same linguistic behavior with diminutives, I analyzed children's accuracy with the  $-e$  suffix by collapsing the relevant conditions. The results are presented in Table 6.10.

**Table 6.10: Accuracy of adjectival inflection with diminutives and root nouns in conditions that require the  $-e$  suffix**

Suffix	$-e$		$-e$	
Type noun	Diminutive		Root	
3 (N= 7)	93 %	27/29	100 %	56/56
4 (N=17)	98 %	79/80	98,5%	188/191
5 (N=15)	98 %	87/89	97,5%	185/190
6 (N=16)	99 %	147/148	98 %	411/419
7 (N=16)	99 %	169/171	99,5%	440/443
8 (N=14)	98,5%	133/135	98,5%	279/283

Table 6.10 indicates that, similar to their performance with root nouns, children were highly accurate with adjectival inflection with diminutives in conditions that require the *-e* suffix.

#### 6.6.4 Consistency analysis

The results from the accuracy analysis with root nouns (Table 6.7) indicated that, as children grow older, they become more accurate with the *-∅* suffix in the special case. Results also indicated that children are, for the most part, target-like by about eight years. The observed delay in the correct use of the *-∅* suffix, however, might not reflect children's knowledge about the inflectional rule. It is possible that their use of the *-e* suffix is due to their incorrect attribution of grammatical gender. If this were the case, they would still make 'errors', but their errors would be consistent with the combination of underlying morphosyntactic features. If this were the case, I would expect children to consistently choose adjectival forms that are in accordance with the definite determiner they use with each particular noun.

The consistency analysis focused on children's use of grammatical gender in definite determiners and their use of grammatical gender in attributive adjectives in the indefinite, singular condition. A maximum of three definite determiner responses was collected per noun (twice in the gender attribution test and once in the adjectival inflection). In order to reliably conclude that a child attributed a particular gender to a particular noun, the following criterion had to be met: First, the child must have produced the same determiner with a noun at least two times. For example, the word *buis* 'house' was classified 'stable' when a participant produced *bet buis/bet buis* or *de buis/de buis*. A noun was classified 'unstable' if a participant used a combination of *de/bet*, *de/de/bet* or *de/bet/bet* with this noun. For example, if a child said *bet buis* in one response, and *de buis* in another, I concluded that the noun's gender was unstable. The consistency analysis included only those nouns to which children attributed stable gender. Likewise, children's unstable gender responses and the nouns for which I collected less than two overt gender markings were excluded from further analysis.

A similar method was used to analyze children's gender attribution in indefinite, singular constructions. Here, production of the *-e* suffix was taken as evidence that a child attributed common gender to a given noun, while production of a *-∅* suffix was taken as evidence that a child assigned neuter

gender to a given noun. In order to assess children's consistency in using grammatical gender with definite determiners and attributive adjectives, for each noun, I compared children's choice of the definite determiner with their choice of the adjectival form (see also Section 6.5).

Table 6.11 summarizes the results of the consistency analysis. Note that the consistency analysis included only root nouns: Diminutives were excluded. The problem with diminutives is that they do not allow me to reliably tease apart whether children used a combination of *indefinite determiner* – *bare adjective* – *diminutive* or whether they applied an inflectional rule, i.e. whether they combined the underlying morphosyntactic features.

**Table 6.11: Consistency of grammatical gender in definite determiners and adjectival inflection**

Gender	[+NEUTER]		[-NEUTER]	
Definite determiner	HET		DE	
Adjectival suffix	-∅		-e	
3 (N= 7)	0 %	0/2	87 %	20/23
4 (N=17)	76,5%	13/17	93 %	57/61
5 (N=15)	79 %	19/24	97 %	34/35
6 (N=16)	64 %	30/47	98,5%	74/75
7 (N=16)	60,5%	23/38	87 %	68/78
8 (N=14)	96 %	47/49	97 %	59/61

As can be seen in Table 6.11, children's use adjectival inflection was rather consistent with nouns that they consider a *de*-word (87 – 97%). This means that stable use of *de* goes hand-in-hand with use of the adjectival suffix *-e*. With respect to children's production of *het*, I observed that the children between the ages of four and eight performed clearly above chance, but were clearly not

entirely consistent (as reflected in their 60,5-96% consistency). Three-year-olds produced only two instances of stable neuter gender in definite determiners. A mixed ANOVA revealed a significant effect of grammatical gender ( $F(1,41) = 9,128, p < .01$ ): Children were more consistent with stable common nouns than they were with stable neuter nouns.<sup>9</sup> I did not observe an effect of age with respect to the consistent use of grammatical gender in definite determiners and adjectival inflection.

## 6.7 Interpretation of the results

The two guiding questions of this empirical investigation were: (1) *To what extent do the data from child Dutch support the idea that children know agreement inflection from early on?* And (2) *To what extent can salience account for the order of acquisition of inflectional morphemes in monolingual Dutch children?* In order to answer these questions, I analyzed elicited production data from monolingual Dutch children aged three to eight years.

First, I observed that children had no problems in contexts where the  $-e$  suffix was required: The accuracy analysis revealed 92 -100% correct usage for this morpheme. In contrast, for the special case context, which requires the  $-\emptyset$  suffix, a significant age effect was observed with root nouns: The occurrence of the  $-\emptyset$  suffix increased with age. This contrast in development between the attributive adjectives with  $-e$  and the attributive adjectives with  $-\emptyset$  confirms the results of Weerman et al. (2006).

In Section 6.6.4 I argued that the results obtained from the accuracy analysis (Section 6.6.1) were not sufficient to determine whether or not children know inflection rules for adjectival agreement. In other words, the accuracy analysis in Table 6.7 does not allow us to conclusively determine whether or not the delay of the  $-\emptyset$  suffix is caused by a lack of knowledge about inflection or whether it is due to the tendency of children classify neuter nouns as having common gender. Given the observations from the previous studies (Deutsch and Wijnen, 1985; Van der Velde, 2003), it is conceivable that children's frequent overuse of the definite determiner *de* could be related to their frequent overuse of the  $-e$  since, according to the agreement rule, attributive adjectives in the indefinite, singular context require the  $-e$  suffix if the head noun is a common noun, or in other words, if it is a *de*-word, (Bol and Kuiken, 1988; Weerman et al., 2006).

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<sup>9</sup> I excluded the three-year-olds from the statistical analysis as I obtained only two instances of stable neuter gender.

This rather complex issue has been addressed in the consistency analysis (Section 6.6.4), where I analysed each noun separately and compared the children's choice of a definite determiner and the children's choice of an adjective in the indefinite, singular context. I found that children were consistent with their use of common gender. For example, when children steadily assigned the definite determiner *de*, they consistently used an adjective with *-e* in the indefinite, singular context. With respect to neuter gender (i.e. the stable definite determiner *bet* was consistent with the bare adjective), children from the age of four onwards performed above chance level (60,5 – 96%). Altogether, the results of the consistency analysis suggest that children use adjectival agreement that is consistent with the definite determiner they produce, provided that their choice of the definite determiner is stable. In other words, children seem to know the rule system for adjectival inflection, but they still have to learn that there are also words that have neuter gender.

Note that the available data from three-year-olds do not provide conclusive evidence for or against this claim. The major overuse of common gender in three-year-olds resulted in classification of only two root nouns as having stable neuter gender. Although the high consistency with nouns that three-year-olds classified as having a common gender could be taken as an evidence for using an inflectional rule, an alternative explanation is that children use two independent default forms (i.e. *de* and *-e*). Similarly, analyses of three-year-olds' performance with adjectival inflection with diminutives (as reported in Section 6.6.3) are compatible with two explanations: 71% correct use of the bare adjective and 93% correct use of the *-e* suffix could serve as evidence that three-year-olds are using inflectional rules. However, it could also mean that three-year-olds are relying on individual lexical combinations (Tomasello, 2003; Goldberg, 2003) such as *indefinite determiner – bare adjective – diminutive* or *definite determiner – inflected adjective – diminutive*.

Nevertheless, additional evidence for the asymmetry between grammatical and lexical knowledge comes from a separate comparison between the development of neuter gender in definite determiners and the development of neuter gender in adjectival inflection in the indefinite, singular context. Figure 6.1 illustrates the accuracy rates for all ages under investigation.



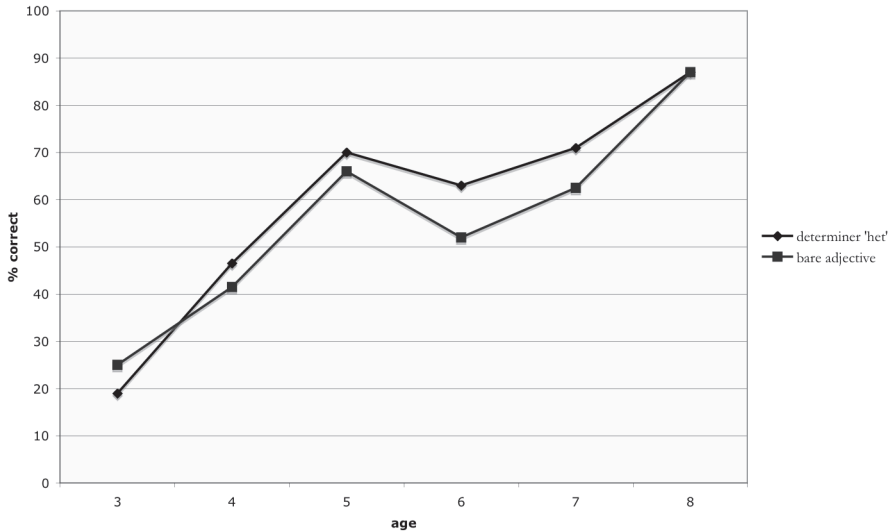


Figure 6.1: Accuracy rates for *bet* in the definite determiners and for the  $-\emptyset$  suffix in the attributive adjectival inflection.<sup>10</sup>

Figure 6.1 shows that increased use of the neuter definite determiner *bet* went hand-in-hand with increased use of the  $-\emptyset$  suffix in indefinite, singular, neuter contexts. Similar to the results from the consistency analysis, these observations show that the inflectional rule is not developing over time. Instead, the number of cases in which children can use the rule is increasing. Put differently, children produce more bare adjectives as they learn that more nouns are of the neuter gender. Figure 6.1 suggests that when children establish gender, they tend to use that gender in many grammatical domains. This explains children's overuse of the *de* determiner, as well as their overuse of *schwa*-inflected adjectives.

It appeared, however, that children between four and seven years were less consistent with stable *bet*-words than with the stable *de*-words. Thus, despite the stability of *bet*, the consistency analysis revealed that children still sometimes overused the  $-e$  suffix. This observation is in accordance with the

<sup>10</sup> The results for the  $-\emptyset$  suffix in the attributive adjectival inflection are based on the accuracy percentages in Table 6.7.

form-feature specification of the target system presented in Chapter 3, and repeated here in (5).

(5)	/ø/	↔	[+ATTR; -DEF; +NEUT; -PL]
	/e/	↔	[+ATTR]
	/ø/	↔	[-ATTR]

Following (5), the substitution pattern found in this study provides evidence for the claim that the  $-e$  suffix is the default form in the attributive adjectival paradigm. Children's tendency to overuse the  $-e$  suffix thus likely reflects the exceptional status of the  $-ø$  suffix within the attributive adjectival paradigm. Given that the  $-ø$  suffix appears in an extremely exceptional context, it is not so surprising that children sometimes fall back on a default form, even though they produce a stable *het*-word.

In Chapters 2 and 3, I explored how salience could influence the development of agreement inflection. To what extent does salience account for the observations in this chapter? Our prediction was that there would be an asymmetry in children's acquisition of attributive adjectival morphemes, namely, that the  $-e$  suffix would be acquired earlier than the  $-ø$  suffix. The data obtained in this study do not confirm this prediction. Although I found a considerable delay in children's use of the  $-ø$  suffix in the attributive position (Table 6.7) this delay appears to be superficial. The consistency analysis (Table 6.11) showed that children did not have problems using the  $-ø$  suffix when the gender attribution for a particular noun was stable.

It, thus, appears that children have already acquired all of the inflectional morphemes at the earliest stage under investigation. Therefore, it is not possible to assess the predictions yielded by salience based on the results of my study. Surely, however, this does not mean that salience plays no role. The analysis of children's use of bare adjectives with diminutives (Section 6.6.3), for example, suggests that morphophonologically salient cues are used when learning grammatical gender (e.g. Karmiloff-Smith, 1979; Mills, 1986; Pérez-Pereira, 1991; Rodina, 2006; Polišenská, 2006). It is also possible that diminutives might function as a trigger for Dutch children in establishing the value for neuter gender (Cornips and Hulk, 2008).

## 6.8 Conclusion

Dutch children appear to acquire the rules for adjectival inflection from early on. Analyses of the children's performance with adjectival inflection point out to substantial asymmetries between development of grammatical knowledge, on the one hand, and lexical knowledge, on the other. While the children acquire grammatical rules early, it takes them long to learn relevant lexical properties of nouns (i.e. grammatical gender). This conclusion is compatible with the claims of VEKI that children have knowledge of agreement inflection. One must be cautious, however, in accepting this conclusion in its entirety since I did not find conclusive evidence for the group of three-year-olds. The observation that children were considerably more accurate in using bare adjectives with diminutives than with root nouns suggest that children do use morphophonological salient cues in learning neuter gender.



# 7

## **The inflection puzzle: The found and the missing pieces**

The research in this thesis has extended earlier work in the area of Dutch morphosyntactic development by exploring acquisition of agreement inflection in typically developing monolingual Dutch children. Chapter 1 discussed the Very Early Knowledge of Inflection hypothesis (VEKI), which claims that “at the earliest observable stage (from the time that the child enters the two-word stage around 18 months of age) the child knows the grammatical and phonological properties of many important inflectional elements in their language” (Wexler, 1998: 25). Various existing studies, however, provide empirical evidence that challenges claims made by VEKI. In addition, evidence in support of VEKI was often ambiguous. Consequently, several different interpretations are possible. One purpose of this research was, therefore, to collect new data in order to verify the extent to which claims made by VEKI are supported by acquisition data in child Dutch.

VEKI is based on a maturational account that predicts quick and effortless acquisition of inflection due to internally driven mechanisms on behalf of the child. This means that changes in a child’s output reflect changes inside the child’s underlying grammatical system. By implication, children’s failure to produce correct inflectional forms is often ascribed to immature representations. However, it could also be the case that children’s inflection errors stem from inherent properties of the inflectional morphemes themselves: Certain inflectional morphemes may simply be acquired later because they are not salient and hence, not easily accessible to the language-learning child. Thus, even if one assumes a biological basis for learning agreement inflection, it is crucial to examine salience factors, since they too might influence a child’s pattern of development with inflectional morphemes. In this thesis, I chose to investigate the role of salience in the acquisition of inflection. In Chapter 2, I

discussed five factors that have been reported elsewhere in the literature. These factors are argued to contribute to the salience of a morpheme, and thus influence how accessible the morpheme is to the child. Based on the assumption that a morpheme's level of salience is determined not by a single factor, but instead, by an accumulation of factors, I hypothesized that, in the early developmental stages, children's attention is drawn to the most salient morphemes. In other words, I predicted that the most salient morphemes would be acquired first, followed by less salient morphemes, and that the least salient morphemes would be acquired relatively late in development. Chapter 3 presented a method for calculating how salient a particular morpheme is. Based on the salience level of each particular morpheme, I was also able to make specific predictions regarding the expected order of acquisition of verbal and adjectival morphemes by children learning Dutch.

In order to assess VEKI, I addressed production and perception data in two domains: verbal inflection and adjectival inflection. Chapter 4 investigated Dutch children's production of finite verbal inflection, while Chapter 5 addressed infants' perception of finite verbal inflection. Chapter 6 looked into children's production of attributive adjectival inflection.

The remainder of this final chapter is organized as follows: Section 7.1 summarizes the main findings regarding the Dutch children's knowledge of inflection. Section 7.2 discusses the role of salience in relation to the outcome of the present study. Finally, in Section 7.3, I discuss possible avenues for future research.

## **7.1 How good are Dutch children at learning inflection?**

VEKI, as interpreted in this thesis, led to the prediction that children have full knowledge of inflection from early on. With regard to the present study, I predicted that Dutch children at three years would productively use rules for finite verbal inflection as well as for attributive adjectival inflection. I also predicted that Dutch infants from 18 to 19 months would show perceptual sensitivity to grammatical violations in finite verbal inflection.

Children's production data with finite verbal inflection (Chapter 4) were consistent with VEKI: The data revealed that children were highly accurate with both existing verbs and nonce verbs across various inflectional contexts. In particular, children's high accuracy with nonce verbs showed that Dutch three-year-olds have knowledge of finite verbal inflection. This finding

contradicts results reported in earlier studies. Recall that De Haan (1996) and Blom (2003) reported that Dutch children around the age of three were still showing non-target like use of finite morphemes. De Haan, for example, showed that the frequency of errors in Dutch children's spontaneous speech increases between 2;6 and 3;4. In order to account for the empirical inconsistency between the previous data and the data presented here, it is necessary to take a closer look into how data was analysed in the earlier studies. An important difference between the aforementioned studies and the research conducted in this thesis has to do with which verbs were analysed: Whereas the current study focused strictly on the acquisition of inflection in lexical verbs, the analysis in the earlier studies included modal verbs as well as copula. Given that these verbs have specific paradigmatic properties which differ from those of lexical verbs, it is conceivable that the percentages of errors was skewed. To illustrate this, consider the examples of children's agreement errors in (1), as reported by De Haan (1996).

- (1) a. *ja, die heef ik ook nodig* (Matthijs, 2;11)  
 yes, that have I also need  
 'yes, I need that as well'
- b. *bij kant altijd speen* (Abel, 2;03)  
 he can always pacifier  
 'he can always have a pacifier'

In (1a), the verb *hebben* 'have' is produced as *heef*, whereas in (1b) the modal verb *kunnen* 'can' is produced as *kant*. Given the specific paradigms of these verbs, the forms *heef* and *kant* are incorrect (the correct forms are *heb* and *kan*, respectively). However, the forms in (1) are in accordance with the paradigm underlying verbal inflection for lexical verbs. Thus, it seems that children overuse the rules for the lexical paradigm and apply the  $-\emptyset$  suffix in the 1<sup>st</sup> person singular. In case of the verb *kunnen*, children overuse the  $-t$  suffix in the 3<sup>rd</sup> person singular in the modal paradigm. In fact, these particular inflectional errors do not violate inflectional rules. Rather, it seems to be the case that children mis-classify the verbs and inflect them the same way as lexical verbs.

In this study, observations regarding attributive adjectival inflection (Chapter 6) suggest that children have a clear tendency to use the most general inflectional rule of the target system (Always add  $-e$  to an attributive adjective

except if the noun is singular and has neuter gender and the determiner is indefinite). The exceptional context is a special case, in which the  $-\theta$  suffix must be added. Although my data showed an extreme delay in the production of the  $-\theta$  suffix (as compared to the  $-e$  suffix), it turned out that the delay was likely not caused by a lack of knowledge of agreement rules. The delay is instead due to the process through which children learn lexical properties of nouns. In particular, it seems that children mis-classify neuter nouns as common, which results in delayed emergence of the  $-\theta$  suffix.

The data from three-year-olds presented here do not provide evidence to refute VEKI in its entirety, nor do they provide evidence in complete support of VEKI. First, the three-year-olds consistently classified only two root nouns as having stable neuter gender. Second, three-year-olds were highly consistent with nouns classified as common gender. It is possible that this finding is due to a tendency for children to use default forms for definite determiners and with adjectival inflection (i.e. *de* and  $-e$ ). Thus, it is possible that children use two independent defaults without even being aware of the dependency between the two. Finally, I found that three-year-olds used considerably more bare adjectives with diminutives than with root nouns in the special case condition. Although this observation is compatible with the claims of VEKI (that children are using inflectional rules), it is also compatible with another interpretation, namely that the three-year-olds are relying on lexical combinations (Tomasello, 2003; Goldberg, 2003). If this were true, it need not be the case that children are using inflectional rules to produce a bare adjective in indefinite, singular condition with diminutives.

The perception experiment (Chapter 5) focused on whether 18- to 19-month-old infants acquiring Dutch were able to perceive violations in finite verbal inflection. The experiment tested the contrast between the 3<sup>rd</sup> person singular and the 3<sup>rd</sup> person plural. Data suggest that these children were able to discriminate between grammatical and ungrammatical sentences in the 3<sup>rd</sup> person singular, but not in the 3<sup>rd</sup> person plural. This asymmetry in infants' listening behaviour was not predicted by the VEKI hypothesis.

To conclude, the results obtained from elicited production tasks demonstrated that children are using an underlying abstract rule system. In the verbal domain, this was evident at age three, while in the adjectival domain, this was apparent at age four. The perception experiment, however, showed that there is variation in children's development. The findings from this study make it clear that Dutch children do not have full knowledge of inflection at 18 months. Thus, the results of this study do not support a strict interpretation of



VEKI. Nonetheless, it is important to note that the results also do not provide unequivocal evidence against VEKI. Thus, leaner interpretations of the theory are still possible. I leave this possibility open for future research.

## 7.2 The role of salience in acquisition of inflection

Chapter 2 discussed five salience factors: phonological salience, positional salience, feature salience, feature complexity and input frequency. Based on previous literature, I argued that, in order to capture the complex role of salience in the acquisition of agreement inflection, it is crucial to take into account the cumulative effects of these five salience factors. In Chapter 3, I presented a method for calculating how salient a particular morpheme was. The method was based on the assumption that all salience factors have equal weight. Based on this assumption, children are equally sensitive to the each of the aforementioned types of salience. I hypothesized that it would be possible to predict the order of acquisition of inflectional morphemes based on the calculated degree of salience for each particular morpheme. In other words, I expected that the most salient morphemes would be acquired first, followed by the less salient ones. By implication, the least salient morphemes were expected to be acquired last.

With respect to verbal inflection, the salience calculation led to the prediction that the non-finite *-en* morpheme would be acquired first, followed by all other finite morphemes. Previous research summarized in Chapter 3 suggests that this is, in fact, the case. In particular, children have been reported to be highly accurate in their production of the non-finite *-en* morpheme. With regard to finite verbal morphemes, the perception data indicated that the finite *-en* morpheme was mapped earlier to its underlying features than the *-t* morpheme (Chapter 5). This result was not consistent with my predictions regarding the finite verbal morphemes since I predicted that they would all be acquired around the same time.

In Chapter 3, Section 3.3, I pointed out a potential caveat in the method for calculating salience. Namely, I explained that the method is only reliable for morphemes which score exceptionally high (or exceptionally low) across all the salience factors. If, for example a particular morpheme scored very high in every salience category (thus yielding the prediction that it would emerge early in development), but was, in fact, acquired very late in development, I would be able to conclude that salience is not a major determinant in the acquisition of

inflection. It would be difficult, however, to predict the exact order of acquisition for morphemes with similar salience scores, since it is quite possible that some salience factors are more important than others. We simply do not know, at this point how the factors are weighted when compared to each other.

No developmental variation was predicted with respect to finite verbal morphemes. This prediction turned out to be incorrect which leads me to believe that not all salience factors are weighted equally. In order to gain a better understanding of how the salience factors are weighted, I compared the results from the perception experiment with my predictions for each individual salience factor. Comparison of the finite *-t* and *-en* showed that the *-en* suffix scored higher than the *-t* suffix within phonological salience and feature complexity. Based on feature salience and/or on input frequency, however, one would predict that children should learn the properties of the *-t* suffix earlier than those of the *-en* suffix. This was not the case, suggesting that phonological salience and feature complexity should be weighted higher than feature salience and input frequency.

Note, however, that the interpretation of the results made on the basis of the perception experiment is highly dependent on the form-feature specification presented in Chapter 3, repeated below in (2).

(2)	/t/	↔	[+FINITE; -SPEAKER; -PLURAL]
	/en/	↔	[+FINITE; +PLURAL]
	/o/	↔	[+FINITE]
	/en/	↔	[-FINITE]

Recall from Chapter 3 that the form-feature specification in (2) was established on theoretical grounds and that the use of a default form within the finite paradigm is debated. Given that the default form within the finite paradigm is controversial, I cannot refute the possibility that children's grammar follows a form-feature specification where the *-t* morpheme functions as a finite default. The form-feature specification in (2) assumes that the finite *-en* is less specified than the *-t*. This implies that when the *-t* is overused in plural contexts, its specification is not yet completed. It is also possible, however, to think of a form-feature specification in which the *-t* suffix is specified for [+FINITE] and the *-en* suffix for [+FINITE; +PLURAL]. In this case, the results of the perception experiment would mean that 18- and 19-month-old infants mapped the finite *-t* as well as the finite *-en* correctly to their corresponding features.

This is because the *-t* is present in all finite contexts and the *-en* does not occur in the singular. This speculation shows that a form-feature specification has very important consequences for interpreting the results as well as for establishing predictions formulated on the basis of salience factors.

With regard to adjectival inflection, I predicted that the non-attributive *-ø* morpheme would be acquired first, followed by the attributive *-e*, and that the attributive *-ø* would be acquired last. The literature overview in Chapter 3 confirms that Dutch children use the non-attributive *-ø* correctly from the onset of their production. The predicted asymmetry, however, between children's acquisition of attributive *-e* and attributive *-ø* was not supported by the data. That is, children did not have problems with either suffix when the gender attribution for a particular noun was stable.

Production data showed that children had already finished acquiring adjectival inflection at the earliest age under investigation. Therefore, based on the results of my study, it is not possible to assess whether or not the predictions based on salience hold for adjectival inflection. I also predicted that children would master verbal inflection before they mastered adjectival inflection. It turned out, however, that the rules for adjectival inflection were not more difficult for children to acquire than the rules for verbal inflection. One must be cautious, however, in accepting this conclusion in its entirety. Since I did not find sufficient evidence to firmly conclude that the three-year-olds know adjectival inflection, it might still be the case that they find verbal inflection easier.

To summarize, salience surely seems to play some role in children's acquisition of inflection. This is especially evident with morphemes that score consistently high across salience factors. For example, the non-finite *-en* suffix scored high phonological salience, positional salience, feature salience, feature complexity and input frequency. Based on its overall high salience, it is not surprising that the *-en* suffix is acquired early in development. The actual weights of the various salience factors, however, remain unknown. Children's actual performance with finite verbal morphemes, however does give some indication of the weights. Based on the finding that finite *-en* is acquired earlier than finite *-t*, I predict that phonological salience and feature complexity are weighted higher than input frequency and feature salience (positional salience was not relevant for this particular morpheme). This claim, however needs to be tested empirically. Future research should, therefore, focus on formulating a more-fine-grained model of how individual salience factors contribute to

children's acquisition of inflectional morphemes. In such a model, it is essential that one weight salience factors appropriately.

### 7.3 Where do we go from here?

Although the present investigation took us a step further in attaining knowledge about acquisition of Dutch agreement inflection, it also derived several new questions that have yet to be answered. In this section, I will present suggestions for future research.

#### 7.3.1 Verbal inflection

Based on data presented in Chapters 4 and 5, I was able to conclude that the development of finite verbal inflection takes place before the age of three. In support of this conclusion, I found that infants as young as 18 months differentiate grammatical constructions from ungrammatical constructions. My perception experiment, however, tested only one inflection contrast. We still do not know about infants' receptive knowledge of finite verbal inflection for other paradigmatic contrasts. One could approach this issue using the same methodology used in this study. Namely, it would be worthwhile to use the Headturn Preference Paradigm to investigate whether or not infants discriminate between the *-t* and the *-∅* finite suffixes as well as between the *-∅* and the *-en* finite suffixes. The form-feature specification in (2) coupled with the findings of the present study make it possible to generate specific testable predictions. With respect to the contrast between the finite suffixes: *-∅* and *-en*, it is expected that, if infants specify *-∅* as [+FINITE] and *-en* as [+FINITE; +PLURAL], then they would be expected to discriminate between *-∅* and *-en* in the singular but not necessarily in the plural. As for the contrast between the *-t* and the *-∅* suffixes, I expect that, if 18-month-old infants specify both singular morphemes as [+FINITE], then they would not be able to discriminate between the two.

Another issue for further research has to do with the prediction that the children's acquisition of non-finite *-en* precedes their acquisition of the finite morphemes. Although this is evident in children's production (e.g. Blom, 2008; Blom and Wijnen, submitted), it has not yet been investigated in infants' perception. The perception experiment showed that 18- and 19-month-old infants already distinguish between the non-finite *-en* suffix and the finite *-en*

suffix. This suggests that infants younger than 18 months should be sensitive to morphosyntactic violations regarding the non-finite *-en*. This could also be tested in a perception experiment using a Headturn Preference Paradigm. If infants show sensitivity to morphosyntactic violations regarding the non-finite *-en*, I would expect that they will discriminate between the grammatical and ungrammatical sentences such as *Het meisje wil graag buiten spelen* vs. *\*Het meisje wil graag buiten speelt* ‘The girl would like to play outside’.

To summarize, it is necessary to investigate the complete set of paradigmatic contrasts in order to further our understanding of how young children perceive agreement inflection. Not only will this offer insight into how children’s inflection system develops across time, but it will also allow for empirical verification of the form-feature specification of Dutch verbal system as suggested in this thesis.

### 7.3.2 Adjectival inflection

The investigation of attributive adjectival inflection provided support for a developmental asymmetry between grammatical and lexical knowledge: It is not the application of inflectional rules that changes over time. What changes over time is children’s knowledge about lexical properties of individual nouns, i.e. their gender. For reasons I explained earlier, I can not make definite claims with regard to whether or not three-year-olds know adjectival inflection. Thus, future research is needed to determine such.

This study approached this question with a cross-sectional design that compared the performance of different children from various age groups observed at one time point. Recall, however, that it was knowledge of lexical properties of nouns (grammatical gender) that affected children’s performance. Future research should therefore use a longitudinal design that compares the performance of the same children at several time points. This would allow researchers to obtain detailed information about development of children’s lexical knowledge (i.e. gender), which, as we have seen, is crucial in evaluating their production data. An example might be helpful to clarify this point. In the initial states, a child might initially overuse common gender with all neuter nouns in the test. Some time later, however, the same child might overuse common gender only with some neuter nouns. It could also be the case that the child uses an unstable gender with some nouns. If children’s use of inflection rules is productive, then I expect that gender knowledge of a particular noun

should be evident in the child's choice of the definite determiner as well as in their adjectival inflection.

My study also showed that children who do not produce neuter gender determiners also fail to produce correct adjectival inflection in the special case condition. This is not surprising, since this condition is dependent on their knowledge of the neuter gender. This suggests that there is a morphosyntactic feature [+NEUTER] that children must learn. Based on this prediction, children who do not yet have the [+NEUTER] feature, would be expected to err with all constructions that require this gender distinction until they have the specification in their grammar. This includes categories such as demonstratives (*deze/dit* 'this', *die/dat* 'that') and possessives (*onze/ons* 'our'). This claim could be tested in an experiment with nonce nouns. Based on this design, children would first have to learn nonce *het*-words and nonce *de*-words. After assessing whether children indeed classified the nonce noun as having neuter gender (*het*-words), one could test whether or not they use the feature to correctly produce other categories which depend on gender distinction. For example, suppose children learn that the nonce word *spol* is a *het*-word. If children have an abstract underlying representation of [+NEUTER], then they should consistently produce *een groot spol* 'a big spol', *dit spol* 'this spol', *dat spol* 'that spol', *ons spol* 'our spol' etc. If they do not have an underlying representation of gender, one would predict that they would be inconsistent with their use of the (proposed) [+NEUTER] feature in these constructions. It should be mentioned, however, that for reasons discussed in previous chapters, this experimental design might not be suited for testing young children.

A final suggestion for future research concerns exploring earlier developmental stages. In order to determine whether or not the *-e* suffix is specified earlier than the *-o* suffix (as predicted by salience), attributive adjectival inflection could be investigated with the Headturn Preference Paradigm. The goal of this experiment would be to test whether or not Dutch infants discriminate between grammatical and ungrammatical sentences in various attributive contexts. If the *-e* suffix is mapped to its underlying features earlier than the *-o* suffix, I predict that infants would detect violations in definite and plural contexts (where a bare adjectival form was used with a plural and/or definite noun), but that they would fail to detect violations in the special case, since, in the early stages, only the *-e* suffix is specified for attributive adjectives.

In sum, future research should include longitudinal data which focuses on acquisition of adjectival agreement in individual children. In addition, it would

be helpful to examine children's earlier stages of development in attributive adjectival inflection. Doing so would help us gain a more thorough understanding about the process that children go through in learning inflection. Such an approach would also offer valuable insight into the relation between grammatical and lexical development.





## APPENDIX 4.1:

## Scoring sheet for the Verbal Inflection Test

Name:

Age/Sex:

Date recording:

Transcription by:

## Verbal inflection in SVO order

Item	1SG	2SG	3SG	3PL
Existing				
Tekenen				
Drinken				
Nonce				
Pieren				
Spollen				

## Verbal inflection in WH-questions

Item	2SG inversion
Existing	
Tekenen	
Drinken	
Nonce	
Pieren	
Spollen	

Response marked in bold:

Response marked in italics:

NR

NB

XXX

response contains incorrect inflection suffix

response contains an alternative construction,  
i.e. root infinitive, dummy auxiliary or present  
progressive

no response

response is irrelevant to the data analysis

response is unintelligible

## APPENDIX 4.2:

**Distributions of the response types across existing and nonce verbs in raw figures.**

**Appendix Table 4.2.1: Response types with existing verbs**

<b>Age group</b>	<b>Correct inflection</b>	<b>Incorrect inflection</b>	<b>Alternative construction</b>	<b>Irrelevant</b>	<b>Unintelligible</b>	<b>No response</b>
3 (N=145)	94	6	35	5	1	4
4 (N=120)	102	7	7	2	0	2
5 (N=130)	120	3	5	1	0	1
6 (N=150)	147	0	3	0	0	0

N=number of analyzed responses

**Appendix Table 4.2.2: Response types with nonce verbs**

<b>Age group</b>	<b>Correct inflection</b>	<b>Incorrect inflection</b>	<b>Alternative construction</b>	<b>Irrelevant</b>	<b>Unintelligible</b>	<b>No response</b>
3 (N=145)	93	10	33	4	1	4
4 (N=120)	99	6	9	3	1	2
5 (N=130)	122	4	3	1	0	0
6 (N=150)	136	0	12	1	1	0

N=number of analyzed responses

## APPENDIX 5.1:

## Experimental stimuli

**TRIAL PHASE (TR)** (= *getting used to the stimuli and the experimental technique*) contains four passages (two grammatical and two ungrammatical); the order and the position of stimuli is the same for all infants. ‘G3sg’ and ‘G3pl’ stand for grammatical 3<sup>rd</sup> person singular and plural, respectively. ‘U3sg’ and ‘U3pl’ stand for the ungrammatical equivalents.

G3sg_TR	U3sg_TR
Het regent vandaag.	Het regenen vandaag.
De baby lacht lief want mama komt eraan.	De baby lachen lief want mama komen eraan.
Het kleine meisje speelt binnen.	Het kleine meisje spelen binnen.
Mama ruimt de kamer op.	Mama ruimen de kamer op.
Papa leest de krant.	Papa lezen de krant.
De poes miauwt nog steeds.	De poes miauwen nog steeds.
De hond gromt naar de poes.	De hond grommen naar de poes.
G3pl_TR	U3pl_TR
De lichtjes knipperen snel.	De lichtjes knippert snel.
Alle kindjes dragen een pompoen.	Alle kindjes draagt een pompoen.
De moeders doen open.	De moeders doet open.
De vaders geven lekkere snoep.	De vaders geeft lekkere snoep.
Liedjes klinken mooi.	Liedjes klinkt mooi.
De kaarsjes flakkeren zacht.	De kaarsjes flakkert zacht.
Baby's blijven binnen.	Baby's blijft binnen.
De ouders kijken blij.	De ouders kijkt blij.

**TEST PHASE** contains twelve passages (six grammatical and six ungrammatical); the order and the position of stimuli are randomized by a computer programme different for each child.

**Grammatical and ungrammatical passages for 3<sup>rd</sup> person singular**

<b>G3sg_1)</b>	<b>U3sg_1)</b>
Het weer blijft lekker.	Het weer blijven lekker.
Het kleine meisje rent naar buiten.	Het kleine meisje rennen naar buiten.
Mama fietst hard.	Mama fietsen hard.
De hond eet uit zijn bak.	De hond eten uit zijn bak.
Mijn grote broer schreeuwt veel.	Mijn grote broer schreeuwen veel.
Zijn zusje lacht hardop.	Zijn zusje lachen hardop.
De hamster piept eenzaam.	De hamster piepen eenzaam.
Iedereen speelt graag.	Iedereen spelen graag.

<b>G3sg_2)</b>	<b>U3sg_2)</b>
De wind waait door het bos.	De wind waaien door het bos.
Het hert luistert gespitst.	Het hert luisteren gespitst.
De tijger ligt rustig.	De tijger liggen rustig.
De leeuw brult elke dag.	De leeuw brullen elke dag.
Het konijn springt heel hoog.	Het konijn springen heel hoog.
De giraffe drinkt water van de bron.	De giraffe drinken water van de bron.
De slang beweegt erg langzaam.	De slang bewegen erg langzaam.

<b>G3sg_3)</b>	<b>U3sg_3)</b>
Iedereen slaapt vannacht.	Iedereen slapen vannacht.
Opa droomt over biefstuk.	Opa dromen over biefstuk.
Het kind gaapt doodmoe.	Het kind gapen doodmoe.
De wekker rinkelt vroeg.	De wekker rinkelen vroeg.
Papa douchet meteen.	Papa douchen meteen.
Broer weigert op te staan.	Broer weigeren op te staan.
Mama maakt de broodjes klaar.	Mama maken de broodjes klaar.
Oma breit een sjaal.	Oma breien een sjaal.

**Grammatical and ungrammatical passages for 3<sup>rd</sup> person plural**

<b>G3pl_1)</b>	<b>U3pl_1)</b>
De kleuters rennen in het park.	De kleuters rent in het park.
Eendjes krijgen brood.	Eendjes krijgt brood.
De vissers wachten stil.	De vissers wacht stil.
Oma's praten met elkaar.	Oma's praat met elkaar.
De vogels komen dichterbij.	De vogels komt dichterbij.
Kikkers kwaken hard.	Kikkers kwaakt hard.
De blaadjes vallen in het water.	De blaadjes valt in het water.
Ouders roepen hun kind naar huis.	Ouders roept hun kind naar huis.

<b>G3pl_2)</b>	<b>U3pl_2)</b>
De leidsters lezen voor.	De leidsters leest voor.
Alle ridders rijden snel.	Alle ridders rijdt snel.
De kabouters wonen in het bos.	De kabouters woont in het bos.
Clowns gooien met knikkers.	Clowns gooit met knikkers.
De geitjes horen een stem.	De geitjes hoort een stem.
De rovers rennen weg.	De rovers rent weg.
Twee vriendjes bakken een taart.	Twee vriendjes bakt een taart.
De sprookjes lopen goed af.	De sprookjes loopt goed af.

<b>G3pl_3)</b>	<b>U3pl_3)</b>
Auto's rijden hard weg.	Auto's rijdt hard weg.
De fietsers letten niet op.	De fietsers let niet op.
Bootjes varen rustig.	Bootjes vaart rustig.
Twee kindjes maken muziek.	Twee kindjes maakt muziek.
Meisjes dansen mooi.	Meisjes danst mooi.
De toeschouwers maken een foto.	De toeschouwers maakt een foto.
Jongens vangen een vis.	Jongens vangt een vis.
De verkopers bieden van alles aan.	De verkopers biedt van alles aan.

## APPENDIX 6.1:

### Scoring sheet for the Gender Attribution Test and the Adjectival Inflection Test

Name:

Age/Sex:

Date recording:

Transcription by:

#### GENDER ATTRIBUTION TEST\_Child L1 Dutch\_3-5 yrs

Item	GAT 1	GAT 2	GAT 3 [+def]
<i>De-woord:</i>			
Vis			
Baby			
Appel			
<i>Het-woord:</i>			
Glas			
Paard			
Mes			
<i>DIM:</i>			
Huisje			
Cadeautje			
Boekje			

ADJECTIVAL INFLECTION TEST\_Child L1 Dutch\_3-5 yrs

Item	AIT [-def]	AIT [+def]
<i>De-woord:</i>		
Vis		
Baby		
Appel		
<i>Het-woord:</i>		
Glas		
Paard		
Mes		
<i>DIM:</i>		
Huisje		
Cadeautje		
Boekje		
<i>Meervoud</i>		
Huisjes		
Cadeautjes		
Boekjes		

NR

no response

NB

response is irrelevant to the data analysis

XXX

response is unintelligible



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## SAMENVATTING IN HET NEDERLANDS

Dit proefschrift gaat over verwerving van woorduitgangen oftewel flexie in de Nederlandse taal. Meer specifiek: dit proefschrift onderzoekt hoe Nederlandstalige kinderen met normale ontwikkeling de regels voor het vervoegen van werkwoorden (verbale flexie) en de regels voor het verbuigen van bijvoeglijk naamwoorden (adjectivale flexie) leren.

Volgens sommige taalkundigen leren kinderen flexie snel en moeiteloos. Andere taalkundigen echter, menen dat het leren van flexie een gradueel proces is, gekenmerkt door verschillende ontwikkelingsstadia. Dit proefschrift gaat uit van een controversiële stelling van de taalkundige/psycholoog Wexler (1998). Volgens Wexler hebben kinderen al kennis van flexie vanaf de twee-woord fase (dat is ongeveer op de leeftijd van 18 maanden). Vandaar de benaming ‘kleine flexie machines’ die hij de kinderen meegeeft.

De discussie van de relevante literatuur in Hoofdstuk 1 laat echter zien dat de empirische evidentie niet voldoende is om de hypothese van Wexler te steunen of tegen te spreken. Bijvoorbeeld, Wexler’s hypothese is gebaseerd op een observatie dat er heel weinig flexiefouten in de spontane taal van tweejarige kinderen voorkomen. Deze observatie kan echter op twee verschillende manieren geïnterpreteerd worden: Sommige onderzoekers, waaronder Wexler, beschouwen de afwezigheid van fouten als evidentie dat kinderen snelle flexieleerders zijn. Andere onderzoekers, daarentegen, argumenteren dat de afwezigheid van flexiefouten nog geen bewijs is dat kinderen de flexieregels kennen (Tomasello, 2003; Goldberg, 2003). Volgens hen slaan kinderen de vroege flexievormen (b.v. *speelt*) als woorden op in hun mentale lexicon zonder ze verder te analyseren.

De eerste vraag die in dit proefschrift wordt behandeld, is in hoeverre de nieuwe experimentele data van Nederlandse kinderen de stelling dat flexie vroeg geleerd wordt, ondersteunen. Om deze vraag te kunnen beantwoorden heb ik de productiviteit van de flexieregels onderzocht bij Nederlandse kinderen in de leeftijd tussen drie en zes jaar (verbale flexie) en tussen drie en acht jaar (adjectivale flexie). De kennis van verbale flexie is getest door middel van elicitatietaken met zowel bestaande als niet-bestaande werkwoorden. De elicitatietaken zijn ontworpen zodat ze de relatie tussen onderwerp en de persoonsvorm in vijf verschillende contexten uitlokken (1<sup>e</sup> persoon enkelvoud *ik lees*, 2<sup>e</sup> persoon enkelvoud *jij leest*, 3<sup>e</sup> persoon enkelvoud *het meisje leest*, 3<sup>e</sup> persoon meervoud *de kinderen lezen* en 2<sup>e</sup> persoon enkelvoud met inversie *lees jij*).

Het testen van de flexie met niet-bestaande werkwoorden geeft cruciale informatie over de regelproductiviteit: ik verwacht dat als kinderen grammaticale regels productief gebruiken ze geen moeite hebben met het toepassen van de flexie met voor hen onbekende woorden. De analyse van verbale flexie laat vervolgens zien dat Nederlandse kinderen van drie jaar de flexie gebruiken zoals volwassenen dat zouden doen. Op basis van dit resultaat kan ik concluderen dat de regels voor verbale flexie vroeger dan drie jaar aanwezig zijn.

Vanwege cognitieve beperkingen van jonge kinderen is het niet mogelijk om bij kinderen jonger dan drie jaar dezelfde elicitatietaken te gebruiken. Om de flexieontwikkeling van deze leeftijdsgroep toch te kunnen traceren heb ik een waarnemingsexperiment met kinderen in de leeftijd van 18-19 maanden uitgevoerd. Het experiment test of kinderen gevoelig zijn voor schendingen in de relatie tussen onderwerp en persoonsvorm in de 3<sup>e</sup> persoon enkelvoud en in de 3<sup>e</sup> persoon meervoud. De uitkomsten van dit experiment waarin de kinderen grammaticale en ongrammaticale Nederlandse zinnen te horen krijgen, laten zien dat kinderen wel een onderscheid maken tussen grammaticale en ongrammaticale zinnen met een enkelvoudig onderwerp maar dat ze geen verschil maken als het onderwerp in het meervoud is. Met andere woorden, de kinderen luisteren langer naar zinnen zoals *\*De wind waaien door het bos* dan naar zinnen *De wind waait door het bos*. Tussen de zinnen *De liedjes klinken mooi* en *\*De liedjes klinkt mooi* observeerde ik geen verschil in de luistertijden. Dit betekent dat kinderen al rond anderhalf jaar gevoelig zijn voor de verbale flexie maar dat de gevoeligheid nog beperkt is.

In de adjectivale flexie moet een lerend kind rekening houden met de eigenschappen van zowel een lidwoord als van een zelfstandig naamwoord. De regel is: gebruik altijd een *-e* uitgang (b.v. *de finale versie, een korte samenvatting*) behalve als een zelfstandig naamwoord enkelvoudig en onzijdig is en het lidwoord onbepaald is. In deze uitzonderlijke context wordt een adjectief zonder flexie gebruikt (b.v. *een empirisch onderzoek*). De productiviteit van de flexieregels in de adjectivale flexie wordt gemeten door te controleren voor de toekenning van een woordgeslacht. De vraag is dus of kinderen consistent zijn in het toekennen van het woordgeslacht in lidwoorden (beschouwen ze het zelfstandig naamwoord als een *de-* of een *het-* woord?) en in de adjectivale flexie (produceren ze bij hetzelfde zelfstandig naamwoord een *-e* uitgang of geen uitgang als het lidwoord onbepaald is?). De resultaten laten zien dat terwijl kinderen geen moeite hebben met het adjectief met een *-e* uitgang (*mooie*), het gebruik van het adjectief zonder uitgang (*mooi*) juist enorm vertraagd is. Het blijkt echter dat het vertraagde gebruik van het adjectief type *mooi* niet aan de

kennis van de grammaticale regels ligt maar aan de kennis van het woordgeslacht. De data laten zien dat als de kinderen een zelfstandig naamwoord als een *het*-woord beschouwen, ze ook het adjectief zonder flexie consistent gebruiken. Met andere woorden, als de kinderen weten dat *paard* een *het-woord* is, dan zeggen ze correct *een mooi paard*. Hierbij moet opgemerkt worden dat de drie-jarigen nauwelijks *het*-woorden produceren. Daarom kunnen data van de drie-jarigen de bovengenoemde conclusie noch volledig steunen noch geheel tegenspreken.

Op basis van de data verkregen in dit onderzoek concludeer ik dat Nederlandse kinderen de flexie voor werkwoorden vanaf drie jaar productief kunnen gebruiken. De regels voor adjectivale flexie lijken net zo vroeg verworven te zijn als de regels voor verbale flexie, ondanks het feit dat adjectivale flexie een meer complex systeem is dan verbale flexie. De analyses van de adjectivale flexie wijzen op een asymmetrie tussen de ontwikkeling van grammaticale kennis en lexicale kennis. Terwijl kinderen de regels vroeg kennen, duurt het lang voordat ze de lexicale eigenschappen van woorden leren (zoals het woordgeslacht). De resultaten van het waarnemingsexperiment laten een variatie in de ontwikkeling zien. De gevoeligheid voor schendingen tussen onderwerp en persoonsvorm blijkt op de leeftijd van 18 maanden beperkt te zijn. Hoewel de overige bevindingen erop wijzen dat kinderen de flexie vanaf drie jaar kennen, is de uitkomst van het waarnemingsexperiment niet in overeenstemming met de stelling dat kinderen volledige kennis van flexie hebben als ze 18 maanden oud zijn.

Een volgende stap in het onderzoek naar flexie ligt voor de hand. Om meer inzicht te verkrijgen in hoeverre het gehele flexiesysteem van werkwoorden ontwikkeld is op de leeftijd van 18 maanden is het noodzakelijk de gevoeligheid voor grammaticale schendingen in de relatie tussen onderwerp en persoonsvorm in diverse contexten te onderzoeken. Bijvoorbeeld *ik loop* vs. *\*ik loopt* of *ik loop* vs. *\*ik lopen* of *loop jij* vs. *\*lopen jij*. Een relevante aanwijzing in het onderzoek naar adjectivale flexie is dat grammaticale kennis aan de lexicale kennis voorafgaat. Om meer inzicht te verkrijgen in dit proces is het nu van belang om de ontwikkeling van de adjectivale flexie bij individuele kinderen te volgen gedurende een langere periode. Op deze manier kan precies vastgesteld worden of de lexicale kennis van het woordgeslacht hand in hand gaat met de grammaticale kennis (met het toepassen van de grammaticale regels).

De tweede vraag van dit proefschrift heeft betrekking op de rol van de transparantie in het leren van flexie. Met andere woorden, in hoeverre speelt de transparantie van de woorduitgangen een rol in de verwervingsvolgorde.

Wexler (1998) baseert zijn hypothese op het idee van *maturatie*. Dat betekent dat veranderingen in de taalproductie veranderingen in het onderliggende grammaticale systeem weerspiegelen. Dit impliceert vervolgens dat als kinderen flexiefouten maken, dit te maken heeft met onrijpe grammaticale representaties binnen het systeem. Maar het zou ook kunnen zijn dat de flexiefouten het resultaat zijn van de inherente eigenschappen van een woorduitgang. Het kan zijn dat sommige uitgangen later verworven worden, niet omdat ze intern moeten rijpen maar omdat ze beïnvloed worden door allerlei transparantiefactoren waardoor ze voor het lerende kind minder opvallen en minder snel opgepikt worden. In Hoofdstuk 2 bespreek ik vijf verschillende factoren die de transparantie van de woorduitgangen beïnvloeden. Dit zijn fonologische transparantie, positionele transparantie, kenmerktransparantie, kenmerkcomplexiteit en frequentie in het taalaanbod. Op basis van de literatuur beargumenteer ik dat de accumulatie van deze factoren inderdaad de transparantie van een woorduitgang bepaalt en dat het daarom cruciaal is om met al deze factoren rekening te houden. De hypothese is: 'hoe transparanter een woorduitgang is hoe eerder deze geleerd wordt'. In Hoofdstuk 3 introduceer ik een methode waarmee ik de mate van transparantie kan berekenen en vervolgens de voorspellingen voor het Nederlands af kan leiden.

Hierbij moet opgemerkt worden dat het tot nu toe niet bekend is of in het leren van flexie sommige transparantiefactoren meer gewicht hebben dan andere. Daarom heb ik mijn methode om transparantie te berekenen moeten baseren op de aanname dat alle factoren hetzelfde gewicht hebben. Een potentieel nadeel van deze aanname is dat de methode slechts betrouwbaar is voor woorduitgangen die binnen alle vijf factoren steeds hoog (of laag) scoren. Bijvoorbeeld, als een woorduitgang hoog scoort binnen alle factoren maar uit de data blijkt dat deze laat geleerd wordt, kan ik concluderen dat transparantie geen rol speelt bij het leren van flexie. Maar, als een aantal woorduitgangen hetzelfde scores hebben en de data een variatie in de ontwikkeling laten zien dan kan ik niet simpelweg zeggen dat transparantie geen rol speelt. Het kan zijn dat mijn aanname niet klopt doordat sommige factoren meer gewicht hebben dan andere.

De voorspellingen voor de verbale flexie zijn dat kinderen eerst het infinitief uitgang *-en* (*dromen*) leren en daarna de finiete flexie: de vorm zonder uitgang (*ik droom; droom jij*), de vorm met *-t* uitgang (*jij droomt; bij droomt*) en de vorm met *-en* uitgang (*wij/jullie/zij dromen*). Eerdere studies hebben bevestigd dat kinderen inderdaad de infinitieve *-en* eerst leren (b.v. Blom, 2003, 2008; Wijnen, 1995a,b). Volgens mijn transparantieberekeningen hebben de finiete

uitgangen allemaal dezelfde mate van transparantie en wordt er dus geen variatie in de verwerving verwacht. Uit het waarnemingsexperiment blijkt echter dat binnen de groep finiete uitgangen de kinderen de *-en* (*de kinderen dromen*) eerder leren dan de *-t* (*het meisje droomt*). Dit betekent dat het resultaat niet consistent is met de voorspelling dat er geen variatie zou zijn in de verwervingsvolgorde.

Samengevat, transparantie speelt zeker een rol in leren van flexie. Dit is vooral evident voor woorduitgangen die consistent hoog scoren binnen alle transparantie factoren zoals de infinitieve *-en* in de verbale flexie. Het nadeel van de consistente hoge scores is dat het gewicht van de factoren onbekend blijft. Het resultaat van het waarnemingsexperiment waarin de uitgang *-en* eerder geleerd lijkt te zijn dan *-t* suggereert dat de aanname dat alle factoren hetzelfde gewicht hebben niet klopt. Het blijkt dat de finiete *-en* hoog scoort op fonologische transparantie en op het kenmerkcomplexiteit. Dit suggereert dat deze factoren meer gewicht hebben dan de frequentie in de taalaanbod of de kenmerktransparantie (positionele transparantie was niet relevant hier). Om er achter te komen of dit inderdaad het geval is, is het noodzakelijk om deze indicatie te testen in een toekomstig onderzoek.



## CURRICULUM VITAE

Daniela Polišenská studied General Linguistics at the University of Amsterdam. She specialized in first language acquisition and language disorders and wrote her MA thesis on semantic problems in Dutch children with psychiatric disorders. After a short research assistantship at Viataal in Sint Michielsgestel she started her Ph.D. project at the Amsterdam Center for Language and Communication investigating the development of verbal and adjectival inflection by Dutch-speaking children. During this time she was also teaching language acquisition courses at various levels. In 2007 she was appointed as a lecturer at the Department of Slavic linguistics. The research she carried out at the Amsterdam Center for Language and Communication and in the Baby lab in Utrecht between 2003 and 2009 resulted in this thesis.