

# Optimal and Non-Optimal Interpretations in the Acquisition of Dutch Past Tenses

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## 1. Introduction

An aspectual comprehension experiment with Dutch learners reveals an asymmetry in their understanding of the Present Perfect on the one hand versus the Imperfective Past and Periphrastic Past Progressive on the other. Dutch 2 and 3-year-olds have acquired the completion entailment of the Perfect, but do not properly restrict their interpretation of the Imperfective Past and Periphrastic Past Progressive tenses. With the latter children accepted both completion and ongoing situations, in contrast to adults, who favored only ongoing situations. I argue that adults take both speaker and hearer perspectives in comprehension into account. Such bidirectional reasoning about tense forms and their aspectual meanings leads to the selection of the best form/meaning associations and the blocking of less good associations; blocking applies when there exists a better form to express a certain meaning. Children, however, cannot do bidirectional optimization, and hence do not block out non-optimal form/meaning pairs. I show how this results in asymmetry: an overly liberal interpretation of the Imperfective and Progressive tense forms, but target-like understanding of the Perfect.

De Hoop and Krämer (2005/2006) recently modeled the hypothesis that children do not apply both hearer and speaker perspectives in the framework of bidirectional Optimality Theory (OT). When they need to assign meaning to a certain form, children take a pure hearer perspective and when they need to produce a form to express some meaning, they take a pure speaker perspective. De Hoop and Krämer use this model to explain children's non-target-like interpretations of indefinite subjects and objects. Hendriks and Spender (2005/2006) use it to explain an asymmetry in the comprehension and production of reflexives and pronouns. Bidirectional OT is advanced as a model that is well-suited to explain such asymmetries.

In section 2 I discuss the aspectual semantics of three different past tenses in Dutch, and raise some acquisition questions. Section 3 introduces a bidirectional OT analysis of these aspectual form/meaning pairs and spells out the predictions of the hypothesis that children do not apply bidirectional reasoning. Section 4 presents an experiment on children's (and adults') interpretation of the three Dutch past tenses. In section 5 I draw some conclusions.

## 2. Dutch past tenses and their acquisition

### 2.1 Aspectual meanings of Dutch past tenses

Dutch has three different forms to refer to past-time situations. Their meanings vary aspectually. Dutch Present Perfect (*Tegenwoordig Voltwoide tijd*) consists of an auxiliary plus a past participle, (1a). Temporally it may be used with past-time adverbials (like the German, French and Italian Present Perfects, but unlike the English one). Aspectually it functions like the perfects in other languages and refers to the state that holds after culmination of an event or termination of a process eventuality, and so a Perfect combined with a telic predicate entails completion. Dutch Simple Past (*Onvoltooid Verleden tijd*) and the Periphrastic Past Progressive (the so-called *Aan-het* Construction) also refer to past-time situations and combine with past-time adverbials. The Periphrastic Progressive consists of auxiliary *zijn* 'be' plus preposition *aan* 'on' plus determiner *het* 'the' followed by the infinitive form of the verb, (1c). It functions aspectually like any progressive, focusing the ongoingness of an eventuality. Dutch Imperfect Past is formed with a suffix (-*te* or -*de*), (1b). Boogaart (1999) argues that the Imperfect Past is aspectually neutral, allowing both completion and ongoing readings (see also De Swart, 2000; Verkuyl, 2005). He furthermore observes that in narrative contexts an Imperfect Past

combined with an event predicate may give either a completion or ongoing interpretation, while in non-narrative contexts it typically has an ongoing reading.

- |        |   |  |
|--------|---|--|
| (1) a. | Mickey heeft een kasteel gebouwd<br>mickey has a castle built             | <i>Voltooid Tegenwoordige tijd</i> ‘Present Perfect’     |
| b.     | Mickey bouwde een kasteel<br>mickey built a castle                        | <i>Onvoltooid Verleden tijd</i> ‘Imperfect Past’         |
| c.     | Mickey was een kasteel aan het bouwen<br>mickey was a castle on the build | <i>Aan-het Construct</i> ‘Periphrastic Past Progressive’ |

The different aspectual properties of the three Dutch past tenses are illustrated in (2). The combination with a punctual when-clause reveals the aspect: simultaneity indicates ongoingness; a sequence indicates completion. Whether or not the eventuality may continue is an additional aspectual diagnostic. The Perfect, (2a), gives a sequence reading (first seeing, then writing) and does not allow for continuation of the eventuality, because it entails completion. In contrast, both the Imperfect Past and Past Progressive, (2b-c), give simultaneity (seeing and writing at the same time) and continuation of the event is an option, which shows that both are semantically imperfective and lack a completion entailment. Note that the English translation of the tenses in (2b) and (2c) is a Past Progressive, and the best translation for the Perfect in (2a) is English Simple Past, because of the when-clause (example (2b) is from Boogaart 1999:73).

- |        |  |
|--------|--|
| (2) a. | # Marie heeft een brief geschreven toen ik haar net zag en ze is er misschien nog steeds mee bezig.<br>even still at busy<br>‘Mary wrote a letter when I just saw her and she may still be working at it.’       |
| b.     | Marie schreef een brief toen ik haar net zag en ze is er misschien nog steeds mee bezig.<br>still at busy<br>‘Mary was writing a letter when I just saw her and she may still be working at it.’                 |
| c.     | Marie was een brief aan het schrijven toen ik haar net zag en ze is er misschien nog steeds mee bezig.<br>even still at busy<br>‘Mary was writing a letter when I just saw her and she may still working at it.’ |

Eventuality descriptions carry lexical aspect (also called *Aktionsart*, inner aspect, situation type). Usually three or four different kinds are differentiated: events (*e*), processes (*p*) and states (*s*). Only events are telic and implicate a culmination moment. Grammatical aspect is an operator that turns predicates of eventualities into predicates of times. Standard analyses posit that perfect aspect is an operator that asserts the culmination of an eventuality *e* and introduces a result state right after that culmination:  $e \supset c s$ . Progressive aspect says that the reference time is included in the time of the eventuality,  $t \subset e$  (Bennett and Partee, 1978; Klein, 1994; Moens and Steedman, 1988). Lexical and grammatical aspect interact. When a telic predicate such as ‘write a letter’ combines with a Perfect, it asserts that the event culminates, thus entailing completion. The combination of a telic predicate with a Progressive describes the ongoingness of the eventuality, without making claims about its final boundary, i.e., whether or not completion is reached. De Swart (1998) calls this latter effect aspectual coercion; the underlying culmination moment of the event description is effectively stripped off.

In this paper I use the informal terms ‘completion’ and ‘ongoing’ when referring to the meanings of the Dutch past tenses, assuming that a formal analysis underlies these notions. I focus on telic predicates, because the experiment described in section 4 involved only telic predicates. So the tense form/meaning pairs for the combination of a telic predicate with a past tense are the following: Present Perfect maps onto completion; Past Progressive maps onto ongoing; and Imperfect Past is neutral between completion and ongoing.

## 2.2 Acquisition of Dutch past tenses

Across languages tense forms are typically acquired very early as they appear as one of the first inflections on the verb (albeit they do not appear consistently during the initial, root infinitive period). In their study on spontaneous Dutch production data Bol and Kuiken (1988) found that the first Perfect participles (with or without auxiliary) occur by age 2;0, which is earlier than Imperfect Past forms, the first occurrences of which appear a couple of months later.<sup>1</sup> The question that I focus on in this paper is: are these tenses also understood target-like? Production data alone cannot tell how children understand the forms.

In a Dutch tense comprehension study Van de Feest and van Hout (2002) tested tense comprehension using the design developed by Wagner (2001). An experimenter played out three similar situations, for example, doing three puzzles, at different spots in front of the participants, thus creating two different past-time situations (one completed, the other incomplete), which were contrasted to a present-time situation at which the action was ongoing. Three tenses were tested: Present Perfect, Imperfect Past, and Simple Present. The experimenter asked a blindfolded Cookie Monster played by the other experimenter a where-question (e.g., Present Perfect: *Waar heeft het meisje een puzzel gemaakt?* ‘Where has the girl done a puzzle?’; Imperfect Past: *Waar maakte het meisje een puzzel?* ‘Where did the girl do a puzzle?/Where was the girl doing a puzzle?’; Simple Present: *Waar maakt het meisje een puzzel?* ‘Where is the girl doing a puzzle?’). Cookie Monster answers by mentioning one of the three locations (e.g., *bij de boom* ‘at the tree’). The participant’s job was to evaluate Cookie Monster’s answer and say whether it was right or wrong (i.e., a truth value judgment task)<sup>2</sup>.

The results from the 3-year-old participants (n=24, mean age 3;7) showed that they correctly differentiated Simple Present from Imperfect Past, but they did not do so for Simple Present versus Present Perfect, in contrast to the adults. Moreover, they did not always understand the temporal meanings of the three tenses target-like. First, with both past tenses the children sometimes incorrectly accepted the present ongoing situation (Imperfect Past: 31%; Present Perfect: 45%). In contrast, the adult control group accepted neither past tense for the ongoing situation. Second, the children accepted the incomplete situation for both past tenses to some extent (Imperfect Past: 40%; Present Perfect: 42%). This was also in contrast to the control group who did not accept either past tense for the incomplete situation. Third, the children mostly, but not always, accepted the completion situation for the two past tenses (Imperfect Past: only 71%; Present Perfect: only 60%). For the adults the completion situation was always accepted with both past tenses.

Even though children may have been producing various tense forms from the age of 2 or so on, these results suggest that they do not have fully target-like understanding of these forms by the age of 3 and a half. In particular, they had problems with the two past tenses. On the one hand children were overly liberal when interpreting Imperfect Past and Present Perfect (accepting it for all three situations instead of only the completion situation), while on the other hand they were overly hesitant to accept the two past tenses for completion situations.

The main focus of the Van de Feest and van Hout (2002) study was temporal interpretation of past versus present tense. Their results suggest that comprehension lags behind production, which is the opposite from typical developmental paths (comprehension is early and production lags behind). If tense comprehension is indeed delayed, this raises the following questions: how exactly do Dutch children interpret the different tenses, why do they diverge from adult interpretations in the ways they do, and, most pertinently, what do the tense forms children produce themselves mean?

The present study focuses on aspectual interpretation of different past tenses, targeting children’s interpretations with a different design and method. The children in the present study interpret the Present Perfect target-like<sup>3</sup>, but are overly liberal in their interpretations of Past Progressive and Imperfect Past. Before

<sup>1</sup> Bol and Kuiken do not present any data on periphrastic progressives, and I don’t know of any other study on the acquisition of Dutch tense forms that does.

<sup>2</sup> Here the design differed from Wagner’s (2001), who used a situation-selection task in which the experimenter asked the participant a *where* question and the participant chose one of the three locations.

<sup>3</sup> This result on the Perfect contrasts with the result on the Perfect in the Van de Feest and van Hout (2002) study which found that children also accepted the Perfect to some extent for present-ongoing and past-incomplete situations, unlike adults. The difference may be due to the different set-up and task: acting out with props for a truth value judgment task versus telling a narrative with a picture selection task. Possibly the truth value judgment task triggered a slight yes bias, which is countered here with the picture selection task.

I turn to the experiment and its results, I introduce bidirectional Optimality Theory and discuss how it predicts the perfective-imperfective asymmetry in the present results.

### 3. Bidirectional Optimality Theory and acquisition

#### 3.1 *Children lack bidirectional reasoning*

In their interpretation of pronouns and reflexives children display target-like understanding of reflexives, but interpret pronouns too liberally. Hendriks and Spenader (2005/2006) offer a novel explanation for this well-documented stage of acquisition, grounding their analysis of the Binding principles in a bidirectional Optimality Theory (OT) framework. They argue that children lack bidirectional reasoning, following the hypothesis originally advanced by De Hoop and Krämer (2005/2006) in their analysis of children's asymmetric interpretation of indefinite subjects and objects.

In OT syntax the input is a meaning for which the most harmonic form (i.e., grammatical structure) is found; this process essentially takes a speaker perspective. OT semantics is the mirror image: it takes a certain grammatical structure as its input and derives the optimal interpretation for it, like hearers do when they interpret an utterance (De Hoop and Hendriks, 2001). OT syntax thus goes from meaning to form, while OT semantics goes from form to meaning. A bidirectional OT analysis considers all possible form/meaning pairs in one combined tableau and calculates which pairs are best from a combined speaker/hearer perspective. In such a bidirectional optimization process a form/meaning pair is considered optimal (in fact, super-optimal) if it comes out as the best candidate from both perspectives (Blutner 2000). Super-optimal pairs block other pairs: alternative interpretations for the same form are less good (sub-optimal) candidates, and so are other forms with the same interpretation.

Hendriks and Spenader (2005/2006) redefine Principle A (a reflexive must be locally bound) as a soft (violable) constraint that outranks another soft constraint, Referential Economy (Avoid R-expression >> Avoid Pronouns >> Avoid Reflexives). These two constraints interact as follows. A speaker may only use a reflexive when she intends to give a co-referential meaning, and a hearer will only posit a co-referential meaning for a reflexive. In all other cases a pronoun (or R-expression) must be used. Even though a pronoun violates Referential Economy, it is still the best form to express a disjoint reading, because the alternative form, a reflexive, carries a co-referential reading. Upon hearing a pronoun in need of interpretation, a hearer thus considers two candidate meanings, co-referential and disjoint, both of which are equally good as far as the two constraints go. Adding another layer in the interpretation process, the adult hearer reasons that, had the speaker intended a co-referential meaning, she would have used a reflexive form, so instead she must have intended a disjoint meaning. The disjoint reading of a pronoun thus results as an effect of bidirectional optimization. Children, however, do not take the speaker's perspective into account in interpretation, and thus do not block one of the two meanings, which results in pronouns being ambiguous.

Hendriks and Spenader's (2005/2006) analysis predicts another asymmetry, which is in fact the main focus of their paper. Whereas children are overly liberal with pronouns in the interpretation process, they are expected to produce both reflexives and pronouns target-like, because, in going from meaning to form, the interaction of the two constraints yields only one form for each meaning (bidirectional reasoning is not involved in this process). And indeed, there is recent work that supports this prediction (De Villiers, Cahillane and Altreuter, 2007; Spenader, Smits and Hendriks, 2006).

So the main feature of bidirectional OT is that in interpretation language users weigh both hearer (form-to-meaning) and speaker (meaning-to-form) perspectives in the selection of the optimal meaning for a given form. Children still need to learn the full process of optimization of interpretation, which involves taking into account the speaker perspective in addition to the hearer perspective.

#### 3.2 *Analyzing the Dutch past tenses in Optimality Theory*

I now develop an OT account of the aspectual interpretation of the Dutch past tenses. The analysis involves the interaction of two constraints, and, like Hendriks and Spenader's (2005/2006) analysis for pronoun interpretation, it requires bidirectional reasoning to explain the adult interpretation patterns.

The first constraint is based on the typical pairing of aspect forms and meanings, favoring normal pairings and penalizing abnormal ones. Typological observations determine what is normal and abnormal. Typically, perfect aspect maps onto completion, and progressive aspect map onto ongoingness. The mapping of perfect

onto ongoing is abnormal, so the constraint in (3) penalizes such pairing (cf. Grønn's (2006) OT account of Russian perfective aspect).

(3) \*PERFECT/ONGOING

The second constraint implements the idea that aspectual coercion is to be avoided, either because it is costly to process (Piñango, Zurif and Jackendoff, 1999) or because it is semantically more complex. Telic predicates implicate a culmination moment, hence, using a telic eventuality description leads to the expectation that the described event reaches its culmination. Perfect aspect on telic predicates is compatible with this expectation, but progressive aspect cancels the culmination expectation. So, for telic predicates \*COERCION has the following ordering, (4).

(4) \*COERCION: Avoid Progressive, Avoid Imperfect >> Avoid Perfect

In Optimality Theory production and interpretation are processes of constraint evaluation. I first present unidirectional tableaux for production and comprehension in order to illustrate how the two constraints are evaluated given different inputs. I then combine the production and comprehension perspectives in one bidirectional tableau to illustrate how bidirectional optimization leads to a more restrictive pattern in interpretation. This is the adult pattern. By hypothesis, children do not do bidirectional optimization, but unidirectional optimization, so the unidirectional tableaux represent the children's grammars. For the purposes of this paper I assume that Dutch Imperfect and Progressive behave the same, so I conflate them as one form in the tableaux, Imperfect/Progressive. There are of course differences between the two, which I cannot discuss for reasons of space (but see section 4.3 and Van Hout, 2005a).

In tableaux (5) and (6) optimization is unidirectional; it goes from meaning to form, which is the speaker's perspective. They illustrate how an optimal aspect form is chosen given as input a completion meaning in (5) and an ongoing meaning in (6).

(5) Tableau for producing a completion meaning

Input: Completion	*PERFECT/ONGOING	*COERCION
☞ Perfect		
Imperfect/Progressive		*!

(6) Tableau for producing an ongoing meaning

Input: Ongoing	*PERFECT/ONGOING	*COERCION
Perfect	*!	
☞ Imperfect/Progressive		*

In tableau (5) Imperfect/Progressive aspect violates \*COERCION. The Perfect does not violate either constraint, hence it is the optimal aspect form to produce a completion meaning. In tableau (6) the Imperfect/Progressive aspect similarly violates \*COERCION, but now the Perfect violates \*PERFECT/ONGOING, which is the higher ranked constraint and so this violation is fatal (indicated by \*!). Even though Imperfect/Progressive violates one constraint, they come out as the optimal forms to express an ongoing meaning.

In the next two tableaux optimization takes the hearer's perspective and goes from form to meaning. (7) and (8) illustrate how the three Dutch tenses obtain their interpretation.

## (7) Tableau for interpreting a Present Perfect

Input: Perfect	*PERFECT/ONGOING	*COERCION
☞ Completion		
Ongoing	*!	

## (8) Tableau for interpreting an Imperfect Past

Input: Imperfect/Progressive	*PERFECT/ONGOING	*COERCION
☞ Completion		*
☞ Ongoing		*

In tableau (7) the Perfect input is evaluated for two meaning candidates, completion and ongoing. The ongoing meaning violates \*PERFECT/ONGOING, and so completion is the winner. The other tableau (8) evaluates the meanings of Imperfect/Progressive input. These tenses violate \*COERCION, independent of their meaning. Both meanings are equally preferred, and so both interpretations are OK. This is the interpretation pattern of the children: children equally allowed an ongoing and completion interpretation for the Imperfect and Progressive.

The unidirectional optimization process does not choose among the two readings. Yet, adults, prefer the ongoing meaning. This preference is obtained if evaluation involves bidirectional optimization. Tableau (9) lists pairs of tense forms and aspectual meanings in the first column; all possible combinations of a tense and a meaning are given. For each pair the two constraints are evaluated, just as in a unidirectional tableau. The input is either a form or a meaning; a bidirectional tableau can be used for both interpretation and comprehension processes. The output is one or more super-optimal form/meaning pairs.

## (9) Bidirectional optimization tableau for the interpretation and production of Dutch past tenses

	*PERFECT/ONGOING	*COERCION
☞ <Perfect, Completion>		
<Perfect, Ongoing>	*	
<Imperfect/Progressive, Completion>		*
☞ <Imperfect/Progressive, Ongoing>		*

In tableau (9) the pair <Perfect, Completion> is identified as the super-optimal pair in the first round of optimization, because it is the only pair that does not violate any constraints. In the next round of optimization the pairs that either have a Perfect form or a completion meaning are blocked, i.e., <Perfect, ongoing> and <Imperfect/Progressive, Completion>. These fall out of the competition, because for a Perfect completion is the best meaning and, vice versa, for completion a Perfect is the best form. This then leaves one pair as other super-optimal pairs, <Imperfect/Progressive, Ongoing>, which is marked by ☞, indicating that this one comes out as super-optimal in the second optimization round. So, in bidirectional optimization there is only one interpretation for both the Imperfect and Progressive, in contrast to the unidirectional process, that allows two readings.

One may view this bidirectional reasoning process as a way of modelling a Gricean implicature: be as informative as possible. The completion reading is spoken for by the Perfect and therefore it falls out as a meaning alternative for the Imperfect and Progressive. The hearer reasons: had the speaker intended to express a completion meaning, she would have used the Perfect. So when the hearer interprets an Imperfect or Progressive, she will assign it another reading: ongoing.

Assuming with De Hoop and Krämer (2005/2006) and Hendriks and Spender (2005/2006) that children cannot do bidirectional reasoning, the predictions of this bidirectional OT analysis for aspect acquisition are summarized in (10). Children will accept one reading for the Perfect and will allow two readings for the Imperfect and Progressive, as given by tableaux (7) and (8). Adults in contrast reason bidirectionally and block out the completion reading for Imperfect and Progressive, as in tableau (9).

- (10) Predictions for interpreting Dutch past tenses:
- a. Children: Perfect → completion  
Imperfect/Progressive → completion, ongoing
  - b. Adults: Perfect → completion  
Imperfect/Progressive → ongoing

An additional prediction, which is not tested in the present experiment, is that adults and children alike will produce the right forms for a given aspect meaning (completion → Perfect, ongoing → Imperfect, Progressive), see tableaux (5)-(6). So, like Hendriks and Spender, I predict a comprehension/production asymmetry. I leave this to be tested in future research.

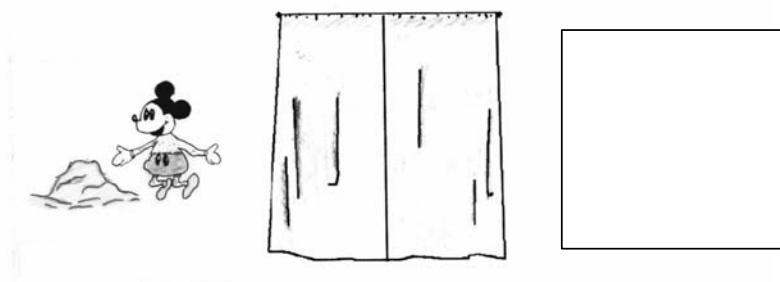
## 4. Aspect experiment

### 4.1 Method

*Participants:* Thirty two 2 and 3-year-olds (age range 2;1-3;11, mean age 3;2) were recruited from three daycare centers in Groningen.<sup>4</sup> In addition a control group of 15 undergraduates from the University of Groningen participated.

*Stimuli:* The stimuli involved stories collected in a picture book. For each story the first picture introduces the story, the middle picture shows closed curtains and the final picture is missing. An example page is shown in Figure 1. This story is about castle-building and goes as follows: *Op een dag was Mickey Mouse op het strand. Hij was in het zand aan het spelen. Wat zou hij eens gaan bouwen? Maar toen gingen de gordijnen dicht en konden we niet meer zien wat er verder gebeurde. Laten we de giraffe vragen om over de gordijnen heen te kijken. [Giraffe looks behind curtains] Giraffe, wat heb je gezien? “One day Mickey Mouse was on the beach. He was playing in the sand. What would he build? But then the curtains closed, so we couldn’t see any further what happened. Let’s ask the giraffe to look behind the doors. [Giraffe looks behind curtains] Giraffe, what did you see there?”.*

Figure 1: Picture book page for castle-building story

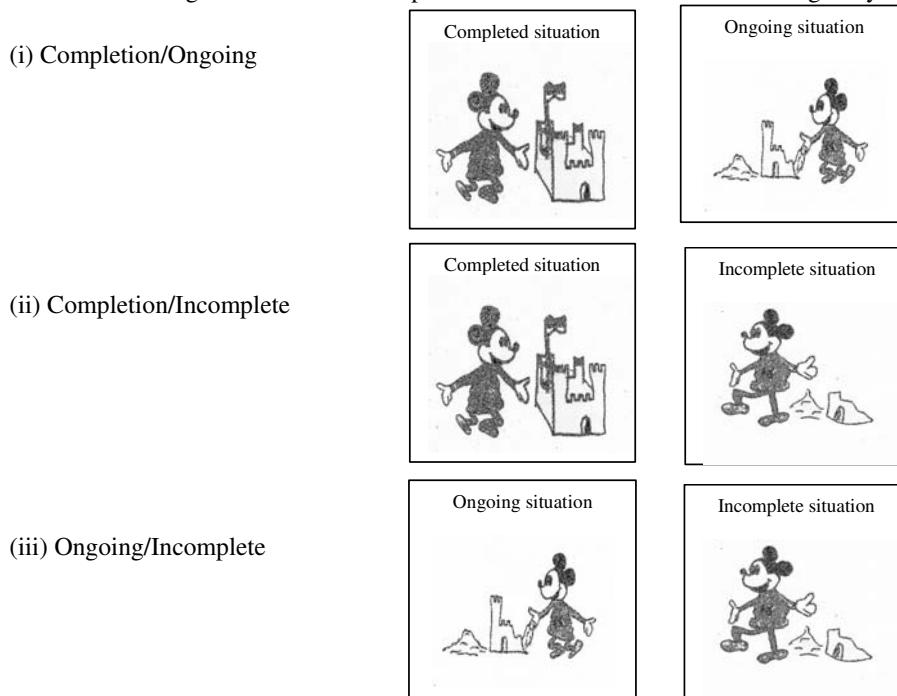


The giraffe spoke the test sentence which contained one of three past tenses: Present Perfect, Imperfect Past or Periphrastic Progressive, (1). Then the experimenter showed two pictures and asked if the right picture was there. There were three different picture pair combinations: i) completion/ongoing, ii) completion/incomplete and iii) ongoing/incomplete. The completion picture showed Mickey turned away from

<sup>4</sup> I am grateful for the hospitality offered by daycare centers *PimPamPet*, *'t Knorretje* and *De Boomhut* in Groningen. I thank Ramona Wolsink for assisting in testing the children.

a finished castle, not working at it anymore. The ongoing picture showed Mickey in the process of working at a sand building, the castle was clearly not yet finished. The incomplete picture showed a half-finished castle and Mickey walking away from it, having stopped his building activities. The three picture choices for the castle-building story are shown in Figure 2.

Figure 2: Conditions of picture combinations for castle-building story



Only telic, transitive verb phrases were used, such as *de auto maken* 'repair the car', *een bloem tekenen* 'draw a flower', *een vis eten* 'eat a fish'. Every VP predicate was used in only one story; some verbs were used twice but with different direct objects. It was important that all predicates were telic, so that the aspectual properties of the three tenses under investigation would show up as different entailments: the Perfect asserts completion, whereas the other two tenses lack this entailment.

The design thus included two factors: tense (3 levels) and picture pair combination (3 levels). For each condition there were three items, yielding a total of 27 items. The items were distributed over three parts, so that each part contained 9 items of the same tense. Featuring just one tense in each part instead of mixing in all three tenses together should focus the participants on one tense at a time so as to present the task in its easiest format. Which tense was tested in the first session and which in the next two sessions was counterbalanced across subjects.

*Procedure:* The child participants were tested individually in a quiet spot in their daycare center. They were tested in three sessions, close to each other, in most cases on three consecutive days. The adult participants were tested in a group and were asked to write down their responses on an answering sheet. They were tested on one afternoon; each next part was given about an hour after the previous one (and they listened to a lecture in the meantime).

Interspersed with the test items there were three control items in each part for which the right picture was not among the two. These were used to ascertain that participants were paying attention and were able to say that neither picture qualified. A training session of four items during which subjects were made familiar with the procedure and the task preceded the test items.

*Coding:* Participants chose one of the situations as their answer (completion, ongoing, incomplete). Sometimes participants found that neither picture qualified (coded as a 'neither' answer) and occasionally they said that both were possible (coded as a 'both' answer).

4.2 Results

Figures 3-5 present the results for each tense. The bars add up the means of each type of answer for each picture pair condition, comparing children and adults.

Figure 3: Results Present Perfect

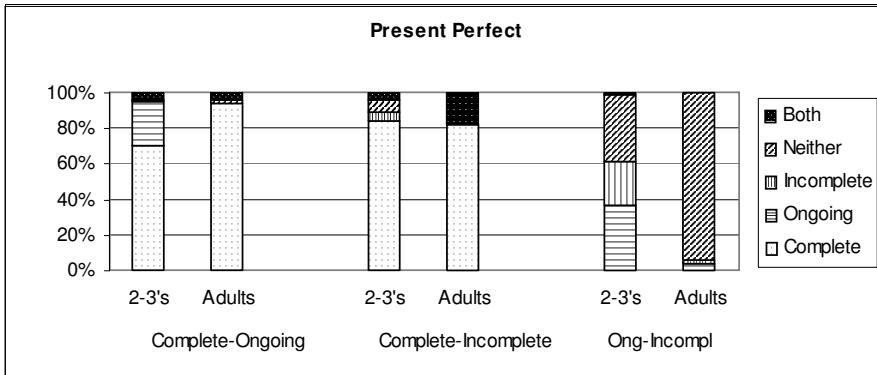


Figure 4: Results Imperfect Past

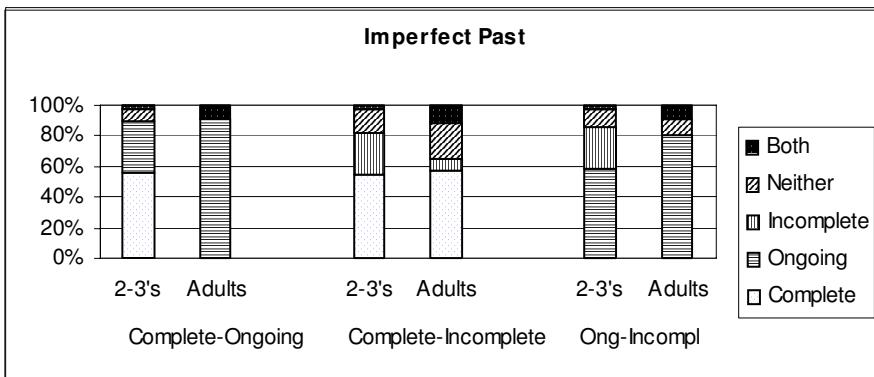
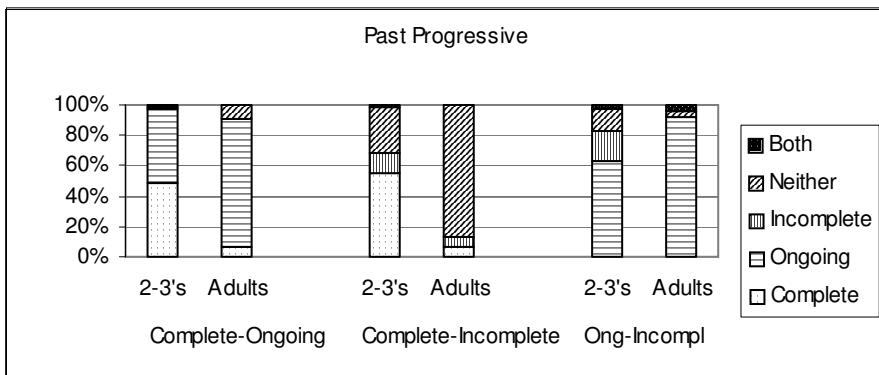


Figure 5: Results Past Progressive



One repeated-measures ANOVA compared the Completion/Ongoing versus Completion/Incomplete condition and another one compared the Completion/Ongoing versus Ongoing/Incomplete condition. I had to run two separate tests, because this ANOVA can only compare two conditions at a time while my design included

three. There were main effects for age, tense and picture pair condition and an interaction effect for tense by age in both analyses (at a level of  $p = .028$  or better). Moreover, there were additional interaction effects in one or the other comparison. In the Completion/Ongoing vs. Completion/Incomplete ANOVA, the interaction between tense and picture pair ( $p = .002$ ) and tense, picture pair and age ( $p < .0001$ ) were significant. In the Completion/Ongoing vs. Ongoing/Incomplete ANOVA the interaction between picture pair and age ( $p = .006$ ) was significant.

With the Perfect children as well as adults preferred the completion situation in both conditions that offered it as an option (Completion/Ongoing: adults 94% and children 67%, Completion/Incomplete: adults 82% and children 80%). When completion was not an option, i.e., in the Ongoing/Incomplete condition, adults found that neither picture qualified (they really wanted to see completion), but children showed confusion, accepting both the ongoing and incomplete situations, instead of saying neither (even though they were able to say neither in the neither-control items). I ran t-tests for each picture pair condition within each tense condition in order to determine how exactly the children were different from the adults. T-tests on the Perfect showed a significant difference for the Completion/Ongoing ( $p = .007$ ) and Ongoing/Incomplete ( $p = .001$ ) conditions, but not for the Completion/Incomplete one.

For adults the interpretation pattern with the Imperfect and Progressive was straightforward: they chose the ongoing situation whenever it was an option: Imperfect Completion/Ongoing 91%, Imperfect Ongoing/Incomplete 80%, Progressive Completion/Ongoing 84%, Progressive Ongoing/Incomplete 89%. When the ongoing situation was not offered, i.e., in the Completion/Incomplete condition, a difference between the two tenses showed up. With the Progressive adults said that neither picture qualified (87%), whereas with the Imperfect they accepted the completion situation (58%) or else said that neither qualified (24%). Children showed a very different pattern. They basically accepted both the completion and the ongoing situation for the Progressive and Imperfect, having no preference for the ongoing situation. This pattern showed up across participants, in other words there was no bi-polar distribution of the two kinds of answers. T-tests on the Imperfect indeed revealed significant differences for the Completion/Ongoing ( $p < .0001$ ) and Ongoing/Incomplete ( $p = .046$ ) conditions, although not for the Completion/Incomplete one. With the Progressive there were significant differences in all three conditions ( $p = 0.14$  or better).

#### 4.3 Discussion

Like adults, children chose only the completion situation for the Perfect. In contrast to adults, who only preferred only ongoing situations for Imperfective Past and Past Progressive, children allowed both completion and ongoing situations. The results thus support the predictions listed in (10) that follow from the hypothesis that children do not optimize bidirectionally in interpretation, but instead apply unidirectional optimization.

Adults showed the same choices for the Imperfect and Progressive, i.e., choosing the ongoing situation, except in one condition. When ongoing was not one of the options, adults found that neither the completion or incomplete picture qualified for a Progressive, but accepted the completion situation to some extent for an Imperfect. This confirms the theoretical discussion about the semantics of the Dutch past tenses in section 2 which suggested that an Imperfect is neutral between perfective and imperfective aspect. It is important to note that the children did not show this preferential pattern of responses, but accepted both situations equally independent of picture pair condition, as predicted by the lack of bidirectional optimization hypothesis.

The adults in this study did not treat the Imperfect totally neutrally, since they preferred an ongoing situation whenever that was possible, and completion only when ongoing was not an option. The design of the present experiment with the three different picture pair choices was essential to establish this preference. Had I offered participants a choice between three situations (completion, ongoing, incomplete), they would have always chosen their preferred situation (ongoing), and not their second choice (completion). In Van Hout (2005a) I explain this finding as an indication that the Imperfect Past is an aspectually sensitive tense that wants to combine with a homogeneous input (in the sense of De Swart, 1998). With telic predicates aspectual coercion imposes progressive or imperfective aspect, which shows up as a preference for the ongoing interpretation in my experiment. I furthermore argue that in these cases culmination of the event is a pragmatic implicature, which explains the finding that adults accept completion too. The interpretational pattern of the Imperfect deserves further theoretical analysis in the present OT framework.

## 5. Conclusions

This study tested the aspectual meanings of three Dutch past tenses, Present Perfect, Imperfect Past and Past Progressive. Dutch 2 and 3-year-olds know the completion entailment of the Perfect, but they incorrectly accept two readings for the Imperfect and Progressive, ongoing and completion. I have argued that children's interpretations diverge from those of adults because they take a pure hearer perspective interpretation, in contrast to adults who apply bidirectional reasoning and take a combined speaker/hearer perspective. I have proposed an aspectual Optimality Theory analysis with two constraints, \*PERFECT/ONGOING and \*COERCION. This analysis explains the adult interpretation pattern as the outcome of bidirectional optimization, and predicts an overly liberal pattern precisely for the Imperfect and Progressive given the assumption that children do not reason bidirectionally (De Hoop and Krämer, 2005/2006; Hendriks and Spender, 2005/2006).

When I tested this same design with Polish learners and adults, I found very similar patterns of interpretation. Polish learners were target-like on perfective aspect, choosing the completion situation, and overly liberal with imperfective aspect (van Hout, 2005b). The fact that I find similar problems with imperfective and progressive form/meaning pairs across aspectually very different languages suggests that it is indeed something about the interpretation of imperfective aspect that causes the problem, rather than a language-specific property of the Dutch Imperfect and Progressive. The hypothesis that children lack bidirectional optimization explains the results in both languages.

Having found that 3 year-old children have non-optimal interpretations of Imperfect and Progressive, we may wonder about their production of these tenses. Do children produce these tenses target-like? Assuming the aspectual OT analysis I have proposed above and the hypothesis that children apply unidirectional optimization, we expect that children will be target-like in their production, despite their non-optimal behavior in comprehension. Hence we predict another comprehension-production asymmetry (Hendriks and Spender 2005/2006).

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