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(Generative Approaches to Language Acquisition)

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Dear reader,

We are very pleased to present here the *Proceedings of 5th GALA Conference* (GALA: Generative Approaches to Language Acquisition). This conference took place in the late summer of 2003 in the old inner city of Utrecht that has benefited scholarship from medieval times onwards.

The two volumes include 4 invited papers plus 38 of the 49 papers that were presented at the conference and accompanying workshops. The presentations at GALA 2003 were selected with the help of 72 colleagues, whose reviewing efforts are hereby gratefully acknowledged.

The conference could welcome 5 invited speakers.

Harald Clahsen	Linguistic Skills in Children with William's Syndrome (not included in the proceedings)
Robin Clark	Competition and Cooperation
Jill de Villiers	Getting Complements on your Mental State (Verbs)
Elan Dresher	On the Acquisition of Phonological Contrasts
Bonnie D. Schwartz	Why Child L2 Acquisition?

There were two very successful workshops at GALA 2003, one about 'Learnability Hierarchies and Input' centering around Robin Clark's contribution, and one about 'Child L2 Acquisition' focusing on Bonnie Schwartz's main topic. The presentations of the main session all dealt with forms of L1 or L2 acquisition. Many of them reported extensively on psycholinguistic experiments. The various contributions discussed acquisition phenomena in nineteen different languages. The talks about phonological acquisition were preceded by Elan Dresher's presentation, those on language disorders were preceded by Harald Clahsen's presentation. The plenary talk by Jill de Villiers closed the conference.

There were many favorable circumstances. The city was beautiful. The weather was great, and the university once again showed its hospitality towards these linguistics activities. We were able to host this GALA conference with the financial support from the Council for the Humanities of the Netherlands Organization for Scientific Research (NWO), the Royal Netherlands Academy of Arts and Sciences (KNAW) and the Utrecht Institute of Linguistics OTS. The Netherlands Graduate School of Linguistics (LOT) allowed us to have these proceedings published in their series. Organizing such an event requires the efforts and energy of many colleagues and students. As editors of these proceedings we speak for the entire organizing committee when we specifically acknowledge the support of the Utrecht linguistics students without whom this conference would not have been possible.

We hope you will enjoy reading the papers.

Sergio Baauw
Jacqueline van Kampen

Acquisition of Mulitiple Case Marking in Korean[1]

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University of Connecticut

1. Introduction

This study investigates the nature of Nominative case in Korean, focusing on multiple Nom constructions, a phenomenon which has been the main source for differing views on Nom case.[2] The study evaluates two opposing syntactic views of Nom case in Korean: default case approach vs structural case approach, by examining the time course of acquisition for relevant constructions using an experimental method. The acquisitional result will provide supporting evidence for the following three arguments. First, Nom case in Korean is not a default case, arguing against Kang (1998), Kuroda (1988, 1992), and Fukui and Takano (1998) among others. Second, the multiple Nom construction is not a property of default case, but an instance of parameter setting of functional head T. Third, the properties of multiple Nom and multiple Acc are not instances of a single parameter.

The first noticeable thing about Korean Nom case is that Nom case is morphologically marked, as well as Acc case, as shown in (1).[3]

(1) Youngja-ga Mary-ul mil-ass-tta.
Youngja-Nom Mary-Acc push-Past-Decl
"Youngja pushed Mary."

Not many languages have morphological forms for both Nom and Acc. As Neeleman and Weerman (1999) noted, particularly among Nom-Acc languages with case morphology, it is more common to have overt Acc case than overt Nom case. For example, Turkish, Finnish, Modern Greek, and Classical Latin all have overt Acc forms, but zero Nom. As the case morphology of Korean is peculiar in this sense, there have been long standing controversies over the nature of Nom. A traditional and also predominant view has been that Korean and Japanese Nom have a completely different nature from what is standardly assumed for Nom in other languages; namely that Korean/Japanese Nom assignment takes place independent of the functional category INFL. It is a default case. One of the major arguments for

[1] I am very grateful to Diane Lillo-Martin and William Snyder for numerous discussions and invaluable suggestions throughout this work. I am also thankful to the participants of 2003 GALA at Utrecht University. Thanks are also due to the children and the teachers at Hannam child care center, without whom, this work would not have been possible. I also appreciate Koji Sugisaki for helping me with the technique for MAC test.

[2] The nature of Nom case has been an issue in syntactic studies of Japanese grammar as well, because the same relevant phenomena are exhibited in Japanese.

[3] Japanese also has overt morphological forms both for Nom and Acc.

this claim has been the presence of Multiple Nominative Constructions (MNC), in which Nom '*-ga*' appears on more than one element in a single clause, as in (2).[4]

(2) a. Youngja-ga ca-ga iss-tta.
Youngja-Nom car-Nom be-Decl
"Youngja has a car."
b. Youngja-ga Mary-ga choh-tta.
Youngja-Nom Mary-Nom like-Decl
"Youngja likes Mary."

In the following section, we review two syntactic analyses for MNC.

2. Syntactic Views to Nom in Korean/Japanese

2.1 Default Case Approach

Default case approach has been argued for by numerous Korean and Japanese linguists (Kim 1990; Kang 1998; Saito 1982; Kuroda 1988 1992; Fukui & Takano 1998). They all share the intuition that the INFL in Korean/Japanese is defective, or at most a place-holder for tense morpheme and nothing more. INFL does not induce agreement, and thus does not have the ability to assign Nom case. Here we look at two particular theories of this approach: Kuroda 1988, 1992 and Fukui and Takano 1998. Kuroda argues that languages are parameterized as to whether agreement is forced or not, which he calls [+/- Forced Agreement] Parameter. He further assumes that agreement must be in a one-to-one relation, restricting one functional head to agree with one maximal projection. English, being a +Forced agreement language, does not allow more than one element to occur with the same case, since a functional head is forced to undergo agreement and the agreement is a relation between a single head and a single functional projection. On the other hand, Korean or Japanese are not subject to this constraint, because agreement is not forced in those languages. Then, the question is how case assignment takes place for those languages. Kuroda proposes a linear case marking mechanism that applies cyclically to the domain of VP, as stated in (3).

(3) *Case marking* (1992)
Mark the first unmarked noun phrase with *-ga*, and mark any other unmarked noun phrases with *-o*.

Languages with the negative setting of the Agreement Parameter are free from the one-to-one agreement constraint, and have linear case marking available to take case of case assignment, which allows multiple case. This predicts that Acc as well as Nom can be multiple as a result of a negative setting of the parameter. In this sense, the Agreement Parameter is global.

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[4] Korean has another form of Nom case, *'-i'*, which is a phonological variant of *'-ga'*. The distribution of each form totally depends on whether the last sound of preceding word is a vowel or a consonant.

Fukui and Takano (1998) propose a mechanism to account for MNC, which incorporates minimalist assumptions, keeping to the idea of deficiency of INFL. They assume that there are two distinct ways of eliminating case features: checking and spell-out. Checking is a mechanism exploited for the elimination of Abstract case. It takes place within the domain of a functional head, following one-to-one convention. T provides the checking domain for Nom case and the light verb v the checking domain for Acc case. The spell-out option is reserved for overt morphological case, so-called case particles. Under the assumption that case particles are morphological realization of case features, and hence according to Fukui and Takano are linked to phonological features, they propose that the case particles make case features visible to spell-out, enabling spell-out to eliminate the case features. In applying this mechanism to Japanese case marking, they are led to conclude that the Nom case particle on a nominal phrase is necessarily a default case inserted to avoid a Case filter violation. This system implies that in the checking system, it is impossible for T to check more than one noun phrase because Nom case feature of T is eliminated when one noun phrase is inserted in the checking domain of T, making further checking unavailable. On the other hand, the system allows spell-out option to eliminate any number of case features as long as noun phrases have case particles. In this theory, multiple Nom and multiple Acc do not have inherent correlation, because whether a language has Nom case particle or Acc case particle is arbitrary.

2.2 Structural Case Approach

Ura (1996) takes a structural case approach to Nom in Japanese, arguing that Tense feature checks Nom case. Under this assumption, T is paramerized as to whether languages allow T to have multiple feature or not, which he calls [+/- Multiple Feature checking] Parameter. On this assumption, MNC is an instance of T with the positive setting of the parameter. This theory expects that if a language has v with multiple features, it should allow multiple Acc construction. Korean does indeed, as shown in (4).

(4) kangaci-ga Youngja-lul tali-ul mul-ess-tta.
dog-Nom Youngja-Acc leg-Acc bite-Past-Decl
"A dog bit Youngja on the leg."

This suggests that Korean has a positive setting of multiple feature parameter for both functional head T and v.[5] Notice here that multiple Nom and multiple Acc involve a separate setting of the parameter on each functional head. This predicts that multiple Nom and multiple Acc do not necessarily go together since one functional head can set a parameter independently of the other.

[5] The status of multiple accusative in Japanese is not clear. The sentence, as provided in (4), is not grammatical in Japanese. However, it has been noted that it is possible in principle, but some superficial constraint blocks it (See Kuroda 1988, and Saito and Hoshi 2000). The situation makes it difficult to determine whether the difference between Korean and Japanese in terms of MAC is parametric in nature.

As we have seen so far, the two syntactic theories, both default case approach and structural case approach, are claimed to account for multiple case phenomena. We are not aware of any decisive empirical evidence which favors one approach over the other. Is there a way to tease the two approaches apart? Cross-linguistic study is difficult, given that not many languages have overt morphology for Nom, as pointed out in the introduction. To circumvent the difficulty, the present study takes an acquisitional perspective as a testing ground for the different approaches.

3. Proposal: Acquisitional Perspective

In this section we consider acquisitional predictions of the different syntactic approaches to MNC that were discussed above. First, let us consider the acquisition of single Nom case. According to the default case approach, it is predicted that children would know that Nom is a default case when they learn Nom case particle since Nom case particle is necessarily a default case. On the other hand, structural case approach predicts that the acquisition of Nom will be contingent on the acquisition of Tense property, which means that children would not be able to use Nom case particle productively until the Tense system is fully developed. Among studies of case development from spontaneous speech data, there is one study which looked at the acquisition of Nom case with respect to the acquisition of Tense morpheme. Matsuoka (1998), examining spontaneous speech data of 3 Japanese learning children, observes that Tense morpheme appears before Nom case. She takes it as supporting evidence that Nom in Japanese is licensed by Tense. She further investigated the emergence of MNC. Interestingly, she did not find any instance of multiple Nom in her data. The following table provides the number of multiple Nom in potential MNC contexts, which were the utterances with stative predicates.[6]

(5)

Child (age)	Stative predicates	Multiple Nom
AKI (1;5-3;0)	199	0
KAN (1;11-3;3)	42	0
Sumihare(2;2-3;0)	48	0

Table 1: Multiple Nom in Japanese child speech (Matsuoka 1998)

Most utterances with stative predicates appeared with only one argument, but when two arguments appeared, only one Nom was used, mostly on the logical object.[7]

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[6] The following are the predicates Matsuoka (1998) examined:
'wakaru' (to understand), *'iru'* (to need), *'dekiru'* (to be able to), *'hoshii'* (desirable), *'suki'* (be fond of).

[7] The following table provides the number of Nom marked NPs, either subject or object, in utterances with two arguments.

Adopting Ura's multiple checking parameter, Matsuoka assumes that children start with the negative setting of the parameter, and they have to reset the parameter on the basis of positive evidence. In other words, children will produce MNC with only single Nom for some period of time, and only later will they produce MNC with multiple Nom. This hypothesis avoids the learnability problem since children learning languages without MNC do not need to use negative evidence in order to unlearn MNC. In this sense, the lack of MNC with multiple Nom from spontaneous speech data may be interpreted as supporting evidence for the argument that the property of multiple feature checking is not available in the early grammar, and only later with the resetting of the parameter will children produce the multiple case marking constructions.

However, there is one crucial point that calls for reservation of the above conclusion. Given that Japanese allows case drop, argument drop, and replacement of case particles with topic marker, it is not clear whether the lack of the production of multiple Nom is due to the lack of knowledge in question. The present study uses a comprehension task to overcome this problem with production. Further, MNC with other types of predicates are used in the task in order to investigate children's acquisition of those MNC types.[8] They involve possessive expressions, as shown below.

(6) a. Youngja-ga ca-ga iss-tta.
Youngja-Nom car-Nom be-Decl
"Youngja has a car"
b. Youngja-ga ko-ga kil-tta.
Youngja-Nom nose-Nom long-Decl
"Youngja has a long nose"

The first type of possessive predicate with the verb *'iss'* allows the subject to alternate with Dative, forming so-called Dative Subject Constructions (DSC), as illustrated in (7).

(7) Youngja-ekey ca-ga iss-tta.
Y-Dat car-Nom be-Decl
"Youngja has a car."

Recall that our purpose is to determine the time course of acquisition of MNC with respect to single instance of Nom. DSC makes a good control item for MNC since

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Table (i): The particle *'ga'* in stative predicates with two arguments

Child	Subject	Object
Aki	1	18
Kan	0	3
Sumihare	1	17

[8] Matsuoka reports in the footnote that there were only 2 instances of MNC with other types of predicate.

they both mark the logical object with Nom and express possession, but multiple Nom appears only in MNC. DSC seems to be a construction with minimal difference compared to MNC. One thing that needs to be considered in drawing predictions about the relative order of acquisition between MNC and DSC is the acquisition of Dat, with respect to single Nom. We checked the acquisition of Dat and the acquisition of single Nom case from longitudinal data. The following data is from Matsuoka (1998).

(8)

	Aki	Kan	Sumihare
Nom	2;2	2;2	1;11
Acc	2;9	2;2	2;1
Dat	2;4	2;2	2;0

Table 2: First clear use of case particles (Matsuoka 1998)

As shown in Table 2, Nom is observed to appear before Dat.[9] Given this, if we test children of above age 2, we can make the following predictions. First, if MNC is a property of Nom being a generalized default case, given that multiple cases come for free on this scenario, DSC is likely to be acquired later than MNC. In other words, we do not expect to find the same children who pass DSC fail MNC, as shown in contingency table (9a). On the other hand, if MNC is a property of multiple feature parameter setting, MNC will be acquired later than DSC, since it takes time to reset the parameter from negative to positive.[10] So we do not expect to find the same children who fail DSC would pass MNC, as shown in contingency table (9b).

(9) a. Default case approach

		MNC: pass	MNC: fail
DSC	pass	√	*
	fail	√	√

b. Structural case approach

		MNC: pass	MNC: fail
DSC	pass	√	√
	fail	*	√

Acquisition of Multiple Acc construction (MAC) with respect to MNC is explored to determine whether the property of multiple case is a single parameter or not. If the property of multiple case is a global parameter, children are likely to acquire MNC and MAC together. It is expected that no children who pass one test, fail the other, as in (10a). However, if the property of multiple case is localized in each functional head T and v, children are not necessarily to acquire them together. So we do expect to find the same children who pass one test to fail the other, as in (10b).

[9] The sign test for the significance of the observed ordering shows that the situation in which Nom appears before Dat by chance has the probability of one in 10^4.

[10] Logically, it is possible that parameter setting may take place somewhere along the way to acquiring Dat, predicting earlier acquisition of MNC with respect to DSC. However, given that the experiment included children of age above 3, it is not likely that the subjects have not acquired Dat.

(10) a. Global parameter

		MNC	
		pass	fail
MAC	pass	√	*
	fail	*	√

b. Local parameter

		MNC	
		pass	fail
DSC	pass	√	√
	fail	√	√

In the next section, we discuss how these hypotheses are tested in the experiment.

4. Experimental Design

Our purpose for the experiment is to determine the relative time course of the three constructions DSC, MNC and MAC. The Truth Value Judgment task (Crain and Mckee 1986) was used in testing the three constructions. An experimenter tells the child stories and asks a puppet questions about the story. The child is asked to judge whether the puppet's answer is true or false based on the story by giving him Donut for the correct answer, or Peach for the wrong answer. There is one thing that needs to be considered in constructing items to test the knowledge of case patterns. Since a given sentence can be understood by basic word strategy without the actual knowledge of case markers, one has to ensure that the child does not use the basic word order. One way is to make the target sentence ambiguous. Suppose that a sentence S will be ambiguous between two readings, the target reading and the non-target reading, in a given context. If the child does not accept one reading consistently, we can conclude that she has not acquired the property responsible for that reading. Each test sentence is made structurally ambiguous in a similar way, by taking advantage of head-final word order. In head-final languages, arguments of the matrix clause appear consecutively with arguments of the embedded clause, leaving the verb to be final. This allows a situation in which some argument potentially can be interpreted as a part of either the matrix clause or the embedded clause. Let us see concrete examples. First consider the sample for MNC test, which involves cleft constructions.[11] This technique was first used in Sugisaki (2002).

(11) Story: Cow, Dwarf, and Rabbit found a small bed. They decided that the shortest one should take the bed. Rabbit says to Cow, "You have a fairly short height". Dwarf says to Cow, "I think you have the shortest height among us". But then, Rabbit says to Dwarf, "No, you have the shortest height."

(12) MNC test item

nanjangi-ga	kajang	ki-ga	jak-tako	malhan-kes-un	nwuku-ni?
dwarf-Nom	most	height-Nom	short-comp	said-comp-top	who-Q

[11] The reason that cleft construction was used to create the ambiguity is because Korean cleft construction allows the element in focus position to drop case markers, making more than one construal possible.

Under the story in (11), question (12) is structurally ambiguous between two readings depending on how to construe *'nanjangi-ga'*. When it is considered as a part of embedded clause, the embedded clause forms MNC, as represented in (13a), rendering the whole sentence to be a question of matrix subject. On the other hand, when it gets interpreted as a part of the matrix clause, as in (13b), the sentence yields a question of indirect object of the matrix verb.

(13) a. MNC reading
t_i **[** nanjangi-ga kajang ki-ga jak-tako **]** malhan-kes-un nwuku$_i$-ni?
dwarf-Nom most height-Nom small-comp said-comp-top who-Q
"Who$_i$ was it that t_i said Dwarf has the shortest height?"

b. non-MNC reading
nanjangi-ga t_i **[** kajang ki-ga jak-tako**]** malhan-kes-un nwuku$_i$-ni?
dwarf-Nom most height-Nom short-comp said-comp-top who-Q
"To whom$_i$ was it that Dwarf said t_i, "Your height is the shortest?""

This is possible because *'nwuku'* in the focused phrase does not specify any case. Accordingly, there are two possible answers available: rabbit for MNC reading and cow for non-MNC reading. Next consider the sample of DSC test. The DSC test item takes the form of two clause level wh-question.

(14) Story: Duck and Youngja decided to run. Duck says to Youngja, "I don't have running shoes". Youngja says to Duck, "You don't? But I have running shoes". Then, Mouse walks over and says, "I have running shoes too". So Duck and Mouse did running. Youngja comes home and says to her mom, "Mom, Mouse has running shoes, but Duck doesn't. Poor duck."

(15) DSC test item
Youngja-ga nwuku-ekey undongwha-ga iss-tako malhaess-ni?
Y-Nom who-to runningshoes-nom be-comp said-Q

Under the given story, question (15) is structurally ambiguous depending on where '*nwuku-ekey'* gets interpreted. If *'nwuku-ekey'* is interpreted as a part of embedded clause, the embedded clause forms DSC, as shown in (16a). As a result, the whole sentence yields a question of embedded subject. If *'nwuku-ekey'* is interpreted as a part of matrix clause, the sentence yields a question of indirect object of the matrix clause, as in (16b).

(16) a. DSC reading
Youngja-ga **[**nwuku-ekey undongwha-ga iss-tako**]** malhaess-ni?
Y-Nom who-to runningshoes-nom be-comp said-Q
"Who$_i$ did Youngja say [t_i has running shoes]?"

b. Non-DSC reading
Youngja-ga nwuku-ekey **[** undongwha-ga iss-tako**]** malhaess-ni?
Y-Nom who-to runningshoes-Nom be-comp said-Q
"To whom$_i$ did Youngja say t_i [that she has running shoes]?"

Two possible answers are available depending on each reading: mouse for DSC reading and Duck for non-DSC reading. MAC test follows the same format.

(17) Story: One day Monkey is skating, but falls down and hurt his legs. He went to hospital. The doctor took a look at his legs and gave them a massage. Then he says, [It is better to wrap your legs with a bandage. I need to ask a nurse for the bandage]. He calls out, [Nurse!]

(18) MAC test item

uysasensangnim-i	nwuku-ul	tali-ul	cwumulun	taume	puless-ni?
doctor-nom	who-acc	leg-acc	massage	after	called-Q

The above MAC test question is ambiguous depending on where *'nwuku-ul'* is interpreted. When *'nwuku-lul'* is interpreted as a part of embedded clause, the embedded clause forms multiple accusative construction, as in (19a). The whole sentence yields a question of the object of the embedded verb, expecting monkey for the answer. When *'nwuku-lul'* is interpreted as a part of the matrix clause, the sentence yields a question of the object of the matrix clause, expecting nurse for the answer, as in (19b).

(19) a. MAC reading

uysasensangnim-i	**[**<u>nwuku-ul</u>	<u>tali-ul</u>	cwumulun	taume**]**	puless-ni?	
doctor-nom	who-acc	leg-acc	massage	after	called-Q	

"Whose leg_i did the doctor call after messaging t_i?"

b. Non-MAC reading

uysasensangnim-i	nwuku-ul	**[** <u>tali-ul</u>	cwumulun	taume**]**	puless-ni?	
doctor-nom	who-acc	leg-acc	massage	after	called-Q	

"Who_i did the doctor call t_i after massaging the legs?"

16 Korean monolingual children with the age in range from 3;4 to 4;10 participated in the actual task. The experiment consists of 3 parts: training, pretest and the actual test. Training part started with a short instruction for the task disguised as a game. 3 stories with each story followed by two simple questions were given for practice. Then, pretest was given in order to ensure that children have the knowledge of interpreting the similar sentence structures as the ones used in the actual task. There were 4 pretest stories, each of which was followed by 3 questions of the similar sentence structures as 3 types of test items. Only those who passed the pretest were included in the actual task. There were 6 stories for each test. In 4 out the 6 stories, the puppet responds with target reading, and in the remaining 2 stories, the response was non-target reading. For all stories, a filler question was given along with the stimuli question.

The result is given below. Children who gave 3 acceptance of target reading out of 4 opportunities were classified as pass, otherwise children were classified as fail.

(20) a. MNC vs DSC test

		MNC	
		pass	fail
DSC	pass	11	5
	fail	0	0

b. MNC vs MAC test

		MNC	
		pass	fail
MAC	pass	8	2
	fail	3	3

See appendix for individual responses.[12]

5. Discussion

The result of MNC vs DSC test has shown that there were 5 children who failed MNC, but all passed DSC. This suggests that MNC is acquired later than DSC, arguing against default case approach. If MNC is a property of Nom being a generalized default case, MNC would have been acquired earlier than DSC given that single Nom is acquired earlier than Dat. However, this result is consistent with Ura's structural case approach. If MNC is an instance of a parameter setting, and if children have to undergo parameter resetting to allow multiple Nom, the time required for the transition of grammar can account for the later acquisition of MNC with respect to DSC. The result of MNC vs MAC test provides further supporting evidence for Ura's multiple checking parameter argument. 5 children passed one test, but failed the other, indicating that MNC and MAC are acquired independently of each other. This is predicted by Ura's argument, according to which multiple Nom and multiple Acc are separate parameter settings of the functional heads T and v. Kuroda's global parameter cannot explain this result since under his theory, both MNC and MAC are a result of a single Agreement parameter. Notice that Fukui &Takano's theory can accommodate the result on MNC vs MAC. However, their theory cannot account for the result on MNC vs DSC test.

6. Conclusion

The nature of Nom case has been a long standing issue in Korean and Japanese grammar studies. The syntactic analyses provided for this issue have remained as theory internal questions without much empirical significance. The present study took up an acquisitional perspective to shed light on the debate. It investigated the acquisitional implication of two main theories to Nom: Default case approach and Structural case approach. The examination of the time course of acquisition for MNC vs DSC shows that that multiple Nom case is not a property of default case, but rather an instance of a parameter setting of functional head T. Further, the acquisitional study of two multiple case marking constructions MNC and MAC shows that the property of multiple case does not come as a single parameter. This study constitutes an argument for the parameter setting model of grammar development.

[12] They are responses for target readings.

Appendix

Individual responses

	Age	DSC	DSC	DSC	DSC	MNC	MNC	MNC	MNC	MAC	MAC	MAC	MAC
1	4;0	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2	3;11	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
3	3;7	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
4	4;1	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
5	4;10	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
6	4;0	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y
7	4;8	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y
8	4;5	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y
9	4;2	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y
10	3;7	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N
11	3;11	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y
12	3;11	Y	Y	Y	Y	N	N	N	N	N	Y	N	N
13	4;1	Y	Y	Y	Y	N	N	N	Y	Y	Y	N	Y
14	3;8	Y	Y	Y	Y	N	N	N	Y	Y	Y	N	Y
15	3;4	Y	Y	Y	Y	N	N	N	N	N	Y	N	N
16	3;10	Y	Y	Y	Y	N	Y	N	N	N	Y	N	N

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Acquisition of Voicing Alternations

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1. Introduction

Morpho-phonological alternations are central to phonological theory, but little is known about how they are acquired. Acquiring alternations amounts to dealing with variation in a morpheme's shape depending on its morphological context. It is generally assumed that children start with an initial stage of phonotactic learning, after which morphology is acquired, i.e. the analysis of words into meaningful units or morphemes. In Optimality Theory (Prince and Smolensky 1993), alternations occur when two or more output forms share a single input form, the lexical or underlying representation. Hence, alternating forms are characterised by a lack of faithfulness to the underlying form of a morpheme. It is not fully understood how children store lexical items and represent the relationship between their contextual variants. Moreover, it is unclear whether early lexical representations differ from those of adults. Here, the various models of morphological processing, such as 'dual-route' models (e.g. Baayen et al. 1997) or 'whole word' models (e.g. Bybee 1995) will not be addressed. It is assumed that although words may be stored as wholes in the first stage of learning, the child will notice the semantic overlap between alternants and arrive at a more abstract lexical representation at a later stage. There are generally two types of alternations, which may be associated with different ages of acquisition. Phonologically conditioned alternations (assimilation, schwa insertion, cluster reduction) are assumed to be acquired early (Bernhardt & Stemberger 1998). MacWhinney (1978) reports that English schwa insertion was optionally applied as early as 2;10. The second type of alternation is lexically conditioned (without clear phonological motivation) and is assumed to be acquired late (Bernhardt & Stemberger 1998). These include alternations associated with suppletive allomorphy and inflectional and derivational morphology.

In this paper we will be concerned with the acquisition of the Dutch voicing alternation, which is of the phonologically conditioned type. The alternation is caused by the cross-linguistically common process of final devoicing (e.g. [bɛt] ~ [bɛdən] *beds*). Crucially, the underlying voice specification of the final segment of the singular stem can only be deduced on the basis of alternations, which poses a

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problem for acquisition. Deriving singulars from newly heard plurals seems a fairly straightforward task given the phonotactic knowledge gained in infancy. In mapping a novel singular onto a plural however, the child must undo the neutralising effect of final devoicing. If only the singular's surface form is known, the plural may contain either a voiced or an unvoiced consonant. To derive the phonological properties of a plural on the basis of a singular, children may assume several strategies. For instance, a child might always opt for a non-alternating form when presented with a novel form (e.g. [kɛt] ~ [kɛtən]). Alternatively, the choice for one of the possible realisations ([kɛtən] or [kɛdən]) might be random, based on the characteristics of phonologically similar words in the lexicon, or based on phonological generalisation.

The various strategies for novel word formation and the predictions that follow from them will be discussed in section 2. The experiment that was carried out to test these predictions was a 'wug-test' in which children were asked to pluralise non-words. This experiment will be described in section 3, followed by the results in section 4 and the conclusions in section 5. First, the voicing alternation and its distribution in Dutch are discussed in the next section.

1.1 The Dutch voicing alternation

Although voicing is distinctive for obstruents in Dutch, the contrast is neutralised in syllable-final position, resulting in coda devoicing. In stems whose final obstruent[2] is underlyingly voiced, final devoicing results in voicing alternations, i.e. the voicing contrast surfaces in inflected forms. This is illustrated in (1) below for the nominal plural, which is formed by attaching a suffix /ə(n)/[3] to the stem. Note that there is no rule of intervocalic voicing, as shown in (1b). Underlying [voice] specifications are contrastive to a certain extent, as there are some 21 minimal pairs in Dutch that differ only in the underlying [voice] specification of the stem.

(1) a. /bɛd/ → [bɛt] *bed* /bɛd/ + ən → [bɛdən] *beds*
b. /pɛt/ → [pɛt] *hat* /pɛt/ + ən → [pɛtən] *hats*

The main mechanism for plural formation in Dutch is the addition of an /s/ or /ə(n)/ suffix. The choice between two productive suffixes depends on the phonological characteristics of the preceding phoneme (cf. Booij 1995). It has been claimed that the use of functionally appropriate plural forms occurs between the ages of 2;7 and 3;1. Irregular forms (i.e. those undergoing stem vowel changes) remain difficult throughout primary school (Schaerlakens 1987). It is expected that plurals involving voice alternations pattern with these irregular forms to some extent. Words that are frequent in their plural form are presumably acquired early

[2] This process applies to labial and coronal obstruents (/p/, /t/) as well as fricatives (/f/, /s/). Velars do not have a voiced cognate in Dutch. In this study, fricatives are not considered, as the voiced/voiceless distinction is thought to be less relevant for fricatives than for stops, as evidenced by word-initial realisations and the small set of minimal pairs (see Ernestus, 2000).
[3] Pronunciation of final [n] is optional.

and rote-learned as unanalysed forms (e.g. [hɑndən] *hands*). Let us now turn to the distribution of voicing alternations in Dutch, which will be used to investigate possible effects of analogy later.

1.2 Distribution of voicing alternations

The distribution of forms with an underlying [voice] specification is not entirely unpredictable. The probability that a neutralised obstruent is underlyingly voiced is governed by a number of factors, the most important of which are place of articulation of the stem-final obstruent and quality of the preceding vowel (Ernestus and Baayen 2001).

For the present study, all orthographic wordforms ending in [ə], (including [ər], [əl] and [ən]) were retrieved from the CELEX lexical database (Baayen et al. 1995) and were restricted to the following environments: a. three types of rhyme (short vowel V_, long vowel V:_ and a vowel followed by a nasal VN_); and b. two types of final obstruent (alveolar T and labial P). Note that 'P' stands for /p/~/b/ alternations and 'T' for /t/~/d/ alternations. All complex and simplex forms in the nominal, verbal and adjectival paradigm were included. For all environments under consideration, the distribution of alternating wordforms was determined by computing the frequencies of an underlyingly voiced final segment as a percentage of the summed type or token frequencies of all forms (i.e. both alternating and non-alternating). This measure can be taken to reflect the probability for a final obstruent to be voiced, see Table 1 below. In a study by Ernestus and Baayen (2001a) a similar measure was used, defined in terms of the segments of the final rhyme according to a CART analysis of Dutch monomorphemic stems. However, the measures used in the present study were restricted to precisely those environments that were used in the experiment.

	Type			*Token*		
	P	*T*	*Total*	*P*	*T*	*Total*
*V_*	22%	14%	18%	72%	51%	60%
V:_	0%	42%	31%	0%	48%	43%
*VN_*	0%	47%	37%	0%	83%	80%
	12%	36%	28%	47%	56%	54%

Table 1: Probability of voicing based on frequency of Dutch wordforms

Table 1 shows that overall, roughly a third of all types and half of all tokens in Dutch alternate. There are several other important observations to be made on the basis of this distribution. First, there is a labial-alveolar split for contexts following long vowels and nasals, which I will call 'lexical gap' environments. Thus, for complex forms such as plurals and infinitives, there is a /b/-gap which does not occur in segmentally similar monomorphemic stems. Put differently, p ~ b alternations only occur after short vowels. Second, the token frequency of p ~ b alternations is much higher than its type frequency, which is mainly due to the high frequency of a single alternating form [hɛp] ~ [hɛbən] 'to have 1st sg / pl'. This allows for testing the different effects of type vs. token frequency. Third, most t ~ d

alternations occur in the vowel-nasal context, although the relative ranking between the short and long vowel environment differs for type and token frequency. This distribution will be taken to reflect children's input, as there is no evidence that child directed speech would reveal a different pattern.

2. Strategies of word formation

Let us now turn to what will happen if a child is confronted with a novel (*wug*) form such as [kɛt] and is asked to form a plural. A first prediction is that any voicing alternations that occur are randomly distributed across environment. Three other options will be outlined below.

2.1 Paradigm Uniformity

First, a strategy of paradigm uniformity or stem to stem faithfulness (cf. Benua, 1997; Bernardt & Stemberger 1998; Burzio 1998; Kenstowicz 1998; Steriade 2000) might lead children to match the singular's voicing value in the plural, producing non-alternations only (e.g. [hɔnt] ~ *[hɔntən] *dogs*). It has been noted by several authors that children produce sequences that are illegal in the target language in the interest of maintaining a non-alternating paradigm. An example involving flapping in American English is provided by Bernhardt and Stemberger (1998). They describe a child who from 2;0 to 3;8 realised taps in monomorphemic words invariably as [d], as in [waːdoʊ] *water*. However, taps in bimorphemic words were realised either as [t] or [d], depending on which appeared in other inflected forms. Hence, the child produced *[ˈsɪtɪŋ] for [ˈsɪɾɪŋ] on the model of [sɪt]. Another example is reported in Kazazis (1969) who provides data from Marina, a four-year-old learning Greek. The sequence *[xe] (velar consonant before front vowel) was innovated in the course of regularizing the verbal paradigm: thus [ˈexete] 'you-pl. have' (adult [ˈeçete]) was produced on account of [ˈexo] 'I have'. To account for these effects within Optimality Theory, output-to-output correspondence constraints have been proposed (McCarthy 1998; Hayes 1999) which require a surface form not to deviate from the surface form of its morphological base, rather than from its underlying representation. These constraints are presumably ranked a priori high (i.e. at the top of the hierarchy) by children acquiring language.[4]

A theory of Paradigm Uniformity predicts that overgeneralisations of voicing in non-words (e.g. [kɛt] ~ [kɛdən]) or errors such as *[pɛdən] will not occur in children's productions. A weaker version of this prediction is that voicing alternations will occur less often than would be expected on the basis of overall lexical frequency.

[4] Note however that Dutch words that are mainly heard in their plural form (such as [hɑndən] *hands*) are never realised as *[hɑnd] in the singular, showing that paradigm uniformity may be overruled by final devoicing in Dutch.

2.2 Analogy

Children may also exploit their knowledge of distributional probabilities of voicing (cf. Cutler & Carter 1987). Under this view, the language-learning child is assumed to be sensitive to the similarity structure in the data and word formation proceeds according to similarity- or exemplar-based analogy. Hence, the formation of a new word is determined on the basis of all phonologically similar words in the lexicon (Skousen 1989, Daelemans et al. 1994). In this approach, paradigmatic structure is given a much greater weight than in traditional rule-based theories. It is important to note that even in a rule-based account, analogical effects are predicted to occur when subjects are asked to inflect non-words. Since non-words do not have a lexical representation, the underlying [voice]-specification of the final segment cannot be retrieved from the mental lexicon. A symbolic morphological rule (add –ən) could be preceded by analogical processes that assign a [voice] specification to the final obstruent of the non-word. This specification may correspond to the underlying [voice]-specification of the final obstruents in some gang of phonologically similar words. Ernestus and Baayen (2001a) found that the proportion of stems in a gang with final voiced obstruents correlated with the proportion of participants interpreting the final obstruents of pseudo-verbs as voiced ($r_s = 0.50$). It is unclear to what extent type and token frequency play a role, but it is generally assumed that type frequency is the most important consideration in word formation (Bybee 1995).

Importantly, an analogy-based strategy could result in alternating forms for non-words or overgeneralisations of voicing. The distribution of these alternating forms would then be expected to mirror the distribution of these forms in Dutch. Hence, it is expected that no alternations will occur in lexical gap environments. Moreover, analogy to single high-frequency items might lead to frequency effects within environments. Results may also reveal effects of analogy to simplex forms.

2.3 Phonological Generalisation

A third possibility is that children postulate phonological generalisations, mirroring cross-linguistically common natural processes such as postnasal or intervocalic voicing. These processes could be phonetically motivated but might also reflect innate knowledge. For instance, postnasal voicing is widespread in the world's languages and is found to occur in child language (Kager 1999). Pater (1999) proposes a constraint against nasal plus voiceless obstruent sequences, which is arguably grounded in articulatory mechanisms that facilitate voicing throughout a nasal-plus-obstruent cluster. Intervocalic voicing is another candidate for phonological generalisation, and has also been reported to occur in child language. Bernhardt and Stemberger (1998) describe a child (4;0) who realised all intervocalic /t/'s and /d/'s as [d], and argue that this is a case of plateauing of the feature [+voice] from the neighbouring vowels. An early rule of intervocalic or intersonorant voicing is likely to be phonologically motivated (Stampe 1969; Hayes 1999, Kager 1999).

This approach predicts that overgeneralisations of voicing will show a decline in acquisition. Importantly, a strategy of phonological generalisation might result in a different distribution of voicing alternations for non-words than the distribution

actually found in the ambient language. Overextension of postnasal or intervocalic voicing might even lead to alternations in lexical gap environments, i.e. in those contexts where alternations are not attested in Dutch.

3. Experiment

To test these predictions, a wug-test (Berko, 1958) was carried out in which children were asked to pluralise phonotactically legal non-words. Words were also included, to test knowledge of the alternation and elicit possible overgeneralisations.

3.1 Subjects

A total of 59 children (36 girls and 23 boys) participated in the experiment. Subjects were divided into three age groups. Children in the first age group (n = 26) attended day care, their ages ranged from 2;9 to 4;0. The second (n = 18, ages 4;1 - 6;2) and third group (n = 15, ages 6;9 - 7;8) were in separate elementary school classes. Subjects were tested in an isolated room in the school.

3.2 Stimuli and design

The stimuli set consisted of 24 non-words (e.g. [kɛt]) and 20 high-frequency words, 12 of which were non-alternating (e.g. pɛ/t/ *hat*) and 8 of which were alternating (e.g. bɛ/d/ *bed*). The set of non-words was constructed to mirror the six environments under investigation, in order to determine the effect of rhyme (V_, V:_, VN_) and final obstruent (P, T). The non-words were chosen in such a way that neither of the two possible 'inflected' forms was an existing Dutch word. In each category, one non-word was added that in its alternating 'plural' form was an existing simplex word of Dutch (with frequency above zero), differing from one of the other non-words only in its onset (e.g. [mɪt] ~ [mɪdən] *middle)*. This was done to test whether analogy to an existing form may prevent or promote the formation of an alternating plural. A set of 26 mono- and polysyllabic filler items was also added. The list of items was constructed in such a way that non-words were separated by fillers or words ending in a different obstruent. Alternating forms did not directly precede non-words. The lists were presented to subjects in two opposite orders. For the full set of experimental stimuli see the results in table 7 below.

3.3 Procedure

To elicit plurals of non-words, pictures of fantasy animals were presented to the child in a PowerPoint slide show. A recorded version of each non-word was inserted, to ensure that all subjects heard the same stimulus. To this end, a recording was made of a female speaker who read the list of non-words aloud, making sure there was an audible release. The stimuli were recorded in a soundproof room by means of a DAT-recorder Aiwa HD S100 and a Sony microphone ECM MS957. The recordings were stored as .wav files (sample rate: 48 KHz) on a laptop by means of the speech analysis package Praat (Boersma 1996). Upon presentation of the first picture, the recorded non-word was played at least twice, in a sentence

context provided by the experimenter ("This is a …"). The child was encouraged to repeat the stimulus. A second (identical) picture then appeared on the screen, upon which the experimenter would prompt the child to form a plural ("Now there are two. There are two…?"). To elicit plurals of existing words, children were shown pictures in the same way and encouraged to first name the stimulus. The test sessions were tape-recorded, and the plural forms supplied by the child were transcribed later.

3.4 Comparison with frequency distribution

To enable a more direct comparison between CELEX frequency and the experimental data, probability of voicing was computed based on the type and token frequencies of precisely those rhymes that were used for the experimental stimuli (i.e. yielding 9 different rhyme categories per obstruent). Probability of voicing was computed in the same way as described above for the overall frequency measure. The results (see table 2 below) illustrate that the high token frequency of the V_P category is due to one rhyme only. A similar frequency count that was based on combined frequency (i.e. complex and simplex forms taken together) was also performed, yielding a total of 4 different frequency measures (differing in token vs. type and complex vs. combined frequency). These measures, reflecting probabilities of voicing, were taken as independent variables. Other independent variables in the analysis are final obstruent and rhyme. The dependent variable (percentage of voiced responses) was measured over the total number of valid responses, treating other responses as missing data.

	P			*T*		
		Token	*Type*		*Token*	*Type*
*V_*	[ɔp]	0.023	0.233	[ɑt]	0.872	0.212
	[ɛp]	0.979	0.154	[ɛt]	0.104	0.115
	[ɑp]	0.031	0.226	[ɪt]	0.019	0.188
V:_	[e:p]	0.000	0.000	[a:t]	0.138	0.500
	[a:p]	0.000	0.000	[e:t]	0.420	0.385
	[o:p]	0.000	0.000	[o:t]	0.242	0.340
*VN_*	[ɛmp]	0.000	0.000	[ɔnt]	0.987	0.600
	[ɪmp]	0.000	0.000	[ɑnt]	0.775	0.591
	[ɔmp]	0.000	0.000	[ɪnt]	0.940	0.417

Table 2: Probability of voicing in experimental rhymes (complex wordforms)

4. Results

All stimuli were transcribed by the experimenter and rated by five additional independent transcribers. Stimuli were excluded if interrater agreement was below 75%; average agreement on the remaining alternating items was 92%. Results for words and non-words are discussed separately.

4.1 Words

Stimuli were transcribed and scored as either correct or incorrect. All children produced some alternating plurals correctly, notably the highly frequent forms [hɑndən] *hands* and [hɔndən] *dogs*. Regularisations of the type *[bɛtən] *beds* (i.e. in the direction of [-voice]*)* occurred in 37% of cases, and persisted well into the oldest age group. Interestingly, overgeneralisations of the type *[pɛdən] *hats* (i.e. in the direction of [+voice]) were also attested in 3% of cases. These forms also occurred in both lexical gap environments: *[lɑmbən] *lamps* (3;5) and *[a:bən] *monkeys* (3;4). Other responses included bare stems (i.e. repetition of the singular or null affixation) and s-plurals. Error percentages for all age groups are shown in table 3.

	All (n=59)	*1 (n=26)*	*2 (n=18)*	*3 (n=15)*
Age range		*2;9 – 4;0*	*4;1 – 6;2*	*6;9 – 7;8*
Overall error rate	17.1	21.7	13.2	16.6
Errors [-voice]	36.5	54.4	27.8	31.3
Errors [+voice]	2.4	3.2	2.6	0.7
Bare stems	1.4	1.8	1.7	0.0
S-plurals	0.9	0.3	2.2	0.0

Table 3: Error percentages for words

4.2 Non-words

17 children (29%) produced alternating plurals for some of the 24 non-words presented to them, ranging from one to seven per child. The total number amounted to 10% of all opportunities or 12% of inflected forms. Note that this percentage drops to only 3% of all forms when all subjects are taken into account. The category 'missing data' refers to null responses (no answer), rhyme changes (e.g. [kla:t] ~ [kla:pən]), real word substitutions ([ta:p] ~ [ta:kən] *tasks*) and diminutive plurals. Results for all subjects are summarised in table 4.

	All (n=59)		*1 (n=26)*		*2 (n=18)*		*3 (n=15)*	
Mean age			*3;4*		*5;2*		*7;1*	
Alternations	41	2.9%	21	3.4%	15	3.5%	5	1.4%
Bare stems	69	4.9%	40	6.4%	28	6.5%	1	0.3%
S-plurals	33	2.3%	8	1.3%	24	5.6%	1	0.3%
Missing data	123	8.7%	62	9.9%	54	12.5%	7	1.9%

Table 4: Responses non-words: absolute and relative numbers (% of total)

Results for the 17 children (10 girls and 7 boys) who produced alternations are shown in table 5 below, as percentages of the total number of forms (i.e. opportunities). In table 6, results are shown for each type of obstruent and rhyme. Results for each age group are summarised in tables 7 and 8. Voicing alternations were not randomly distributed across environments. Results for each item are shown in table 9, to be compared to the data in table 2 above.

	All		*1 (n=8)*		*2 (n=5)*		*3 (n=4)*	
Alternations	41	10.0%	21	10.9%	15	12.5%	5	5.2%
Bare stems	22	5.4%	20	10.4%	2	1.7%	0	0.0%
S-plurals	4	1.0%	1	0.5%	2	1.7%	1	1.0%
Missing	42	10.3%	34	17.7%	2	1.7%	6	6.3%

Table 5: Results non-words for all age groups

	P		*T*		*Total*	
*V_*	8	14.3%	9	16.1%	17	15.2%
V:_	3	5.7%	5	9.1%	8	7.4%
*VN_*	0	0.0%	16	26.7%	16	13.3%
Total	11	6.5%	30	17.5%	41	12.1%

Table 6: Voicing alternations for each environment

	Group 1 (n=8)					
	P		*T*		*Total*	
*V_*	4	17.4%	4	16.7%	8	17.0%
V:_	3	13.0%	4	17.4%	7	15.2%
*VN_*	0	0.0%	6	27.3%	6	14.0%
Total	7	10.4%	14	20.3%	21	15.4%

Table 7: Voicing alternations for group 1 (mean age 3;5)

	Group 2 (n=5)						*Group 3 (n=4)*					
	P		*T*		*Total*		*P*		*T*		*Total*	
*V_*	3	15.0%	5	11.5%	8	15.4%	1	6.7%	0	0.0%	1	3.3%
V:_	0	0.0%	1	4.0%	1	2.0%	0	0.0%	0	0.0%	0	0.0%
*VN_*	0	0.0%	6	23.1%	6	10.9%	0	0.0%	4	25.0%	4	12.5%
Total	3	3.7%	12	15.6%	15	9.5%	1	2.2%	4	8.9%	5	5.6%

Table 8: Voicing alternations for groups 2 (mean age 5;5) and 3 (mean age 7;1)

	P		*T*	
*V_*	[xɔp]	0.000	[slɑt]	0.200
	[tɛp]	0.125	[kɛt]	0.250
	[dɑp]	0.154	[jɪt]	0.077
	[zwɑp]	0.308	[mɪt]	0.083
V:_	[de:p]	0.143	[kla:t]	0.200
	[ta:p]	0.071	[fe:t]	0.000
	[bo:p]	0.000	[kno:t]	0.000
	[xlo:p]	0.000	[zo:t]	0.167
*VN_*	[bɛmp]	0.000	[jɔnt]	0.313
	[kɪmp]	0.000	[flɑnt]	0.400
	[fɔmp]	0.000	[dɪnt]	0.250
	[tɔmp]	0.000	[xɪnt]	0.077

Table 9. Relative number of voicing alternations for each item

A univariate ANOVA with overall percentage of voicing alternations as dependent variable yielded an effect of Final Obstruent ($F(1) = 9{,}483$, $p<.002$) and an interaction between Final Obstruent x Rhyme ($F(2) = 5{,}645$, $p<.004$). This was due to the fact that more alternations were produced for T than for P, and no alternations were found in one of the lexical gap environments (VN_P). None of the children produced voicing alternations consistently in a certain environment. There was no effect of sex or list order. At first inspection, responses of the first age group seem to differ from those of the two older groups, as more voicing alternations were produced in the former, particularly after long vowels.

Nonparametric correlations were performed to assess the relationship between the distribution of children's responses (i.e. the percentage of voiced responses, computed over the total number of valid responses) and the probability of voicing based on CELEX frequency measures. As no interesting differences were found between the overall frequency measure (cf. table 1) and the one based on experimental rhymes, results for the latter are reported here. Results of the two older groups are combined for this analysis, to ensure an equal number of children per group.

Children's overall responses were found to be significantly correlated with token frequency of complex forms ($\rho = .616$, $p<.001$), type frequency of complex forms ($\rho = .558$, $p<.005$), token frequency of combined (i.e. complex and simplex) forms ($\rho = .467$, $p<.021$ and type frequency of combined forms ($\rho = .462$, $p<.023$). Results of the youngest age group (n=8) however did not yield significant correlations with any of the frequency measures, although a low correlation with type frequency of complex forms approached significance ($\rho = .395$, $p<.056$). The results of the two older groups taken together (n=9) correlated with all frequency measures again, but in the following order of strength of correlation: token frequency of complex forms ($\rho = .763$, $p<.000$), token frequency of combined forms ($\rho = .690$, $p<.000$), type frequency of combined forms ($\rho = .492$, $p<.015$) and type frequency of complex forms ($\rho = .485$, $p<.016$).

5. Discussion

The results for words show that even the oldest children have not completely acquired the Dutch voicing alternation. Although the overall error rate does not decrease much with age, the youngest children produced more overgeneralisation errors in both directions (i.e. *[bɛtən] and *[pɛdən]).

To test predictions connected with strategies for new word formation, plurals of non-words were elicited. Results indicate that alternating responses were not randomly distributed. Further analysis suggests that a combination of factors is likely to play a role when children are confronted with a novel singular.

First, it seems that a strategy of paradigm uniformity cannot account for the fact that voicing alternations were produced for non-words ([kɛdən]). Likewise, overgeneralisations of voicing in words (*[pɛdən] *hats*) were not predicted to occur under this view. However, one could argue that an effect of paradigm uniformity was found for the majority of subjects, since only 27% of children produced alternating forms. Moreover, they only did so in 10% of all items offered to them, and never consistently in one environment. The fact that the overall percentage of

alternations was lower than to be expected on the basis of lexical frequency in Dutch lends further support to a strategy of paradigm uniformity.

Second, effects of analogy were investigated by measuring correlations between responses and probabilities of voicing based on CELEX frequencies. This revealed low but significant correlations. A frequency measure based on complex tokens seemed to yield the strongest correlation with the overall results, although differences between frequency measures may be too small to be meaningful.

However, systematic analogy cannot account for all findings. Crucially, voicing alternations for non-words occurred in a 'lexical gap' environment: p~b alternations after long vowels (e.g. [taːp] ~ [taːbən]). Overgeneralisation of postnasal voicing also occurred for words (e.g. *[lɑmbən] *lamps*). Since forms like this never alternate in Dutch, it is unclear how a strategy based solely on analogy could account for this result. When frequency of simplex forms is taken into account, one would expect voicing alternations to occur more often in the postnasal environment, since here both type and token frequency are higher than in the long vowel environment (due to words like [tɔmbə] *tomb*). In fact, no alternations for non-words occurred in this context, suggesting that analogy to simplex forms cannot account for the results. No effect of onset was observed either, i.e. children were not more or less likely to produce an alternating form for a non-word if that form resulted in an existing simplex word of Dutch (e.g. [jɪt] → [jɪtən] but [mɪt] → [mɪdən] *middle*).

Furthermore, no effects of the high token frequency of the V_P environment (due to [hɛp] ~ [hɛbən] *have*) was found for any age group. No within environment effects were observed at all, i.e. it was not the case that more alternations were produced for the non-word [tɛp] than for any other item in that environment, e.g. [dɑp]. This seems to support the observation by Bybee (1995) that the strength of a morphological pattern is related to its type frequency, i.e. that language learners abstract away from tokens.

Finally, the results indicate an interesting effect of age. Children in the youngest age group (with a mean age of 3;5) may be less sensitive to lexical frequency since their results did not correlate with the CELEX measures. Importantly, children in this age group produced the highest number of alternating forms for non-words as well as the highest number of overgeneralisation errors of the unexpected *[pɛdən] type. Furthermore, these children were reponsible for the lexical gap alternations that were produced. The occurrence of these unexpected voicing alternations can be accounted for by an analysis that posits an early (and false) rule of intervocalic voicing. Such a rule would be expected to disappear with time, as the child develops both the correct underlying representations and the correct grammar.

However, it is as yet unclear whether the intervocalic voicing observed is indeed categorical (i.e. phonological) in nature or whether it is a more gradual, phonetic effect. An acoustic analysis of the data is indicated for future research to determine to what extent the voicing contrast is identical across age groups and to correlate the stability of the prevocalic voicing contrast with the degree of alternations in children's elicited productions.

In conclusion, responses of the youngest group in particular show overextension of intervocalic voicing, indicating that young children may generalise from phonological knowledge. These results also suggest that effects of analogy are likely to become stronger in the course of acquisition.

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On the Relation between Input Frequency and Acquisition Patterns from a Cross-Linguistic Perspective

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1. Introduction

Parameter setting approaches may be criticized for a number of reasons. One of them concerns the apparent optionality in acquisition stages. It has been observed for many grammatical domains, e.g. subject pronouns, finite inflection, copula verbs, and determiners, that children pass through variation stages. For instance, in one and the same recording session a child may produce bare and determined nouns under similar syntactic, semantic, and pragmatic conditions.

(1) Adult: oh / c'est quoi ça?
"oh / what's that?"
Child: girafe /
"giraffe"
Adult: hein? / c'est quoi ça? /
"what? / that's what ?"
Child : une girafe /
"a giraffe" (Alexandre 2;2,27)

Some scholars have attempted to uncover rules underlying this variation. For instance, root-infinitives were argued to coincide with a modal interpretation. True or not, this is unexpected under the assumption that children's linguistic behaviour is guided by one syntactic parameter-setting. Roeper (1999) elegantly solves this issue by suggesting *universal bilingualism*. Accordingly, every speaker of a language has a set of mini-grammars for a particular grammatical domain. Variation is now explained by children's simultaneous access to more than one grammar.

Secondly, it is questionable how parameters can be set in a linguistic environment that is heterogeneous for most grammatical domains. For example, we occasionally find subject-drop in English, though it is not a *pro*-drop language.

(2) Care for more coffee? (waiter at *Denny's*, speaker of AE)

Given the child converges on one grammar, how does he/she know what the target is? The multiple grammar-solution can account for this on the assumption that

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grammars continue to coexist even in the adult system. In other words, the child does not need to converge on one parameter-setting, because the adult system displays more than one option.

Thirdly, classical parameter-setting approaches do not account for the gradualness of the acquisition process. In this respect, frequency sensitive models should be favoured, but they raise other questions. In fact, not all frequent phenomena are acquired early, and rare occurrence does not guarantee late acquisition. The root-infinitive phenomenon is often mentioned as a case in point because root infinitives are (arguably) absent in the adult language.

The present contribution is couched in terms of a variational approach to language acquisition (Yang 2002), which combines an experience based learning model with the assumption of an innate grammar. The study is concerned with the acquisition of determiners in bilingual children acquiring German simultaneously with French or Italian. It will be demonstrated that the rate of learning coincides with the relative frequency of overtly realized determiners in the target language. The paper is structured as follows. Section 2 will give an introduction to the Variational Model, section 3 is concerned with NPs and DPs as possible options in UG, sections 4 and 5 provide the empirical part of this work, relating determiner omission in the adult and child grammars. A short conclusion is given in section 6.

2. A variational approach to language acquisition

The Variational Model (Yang (2002)) is based on the idea of coexisting grammars that compete during the acquisition process and get reinforced or punished depending on whether they can parse incoming sentences. Yang draws inspiration from biological evolution. In the Larmarckian tradition, evolution was thought to be transformational: it takes place because each individual organism undergoes the same change. Darwinism, by contrast, holds that evolution is variational. Individuals within a population differ in some properties. Some types, with a particular combination of properties, persist, while others gradually disappear. Language acquisition, too, may be seen from a variational perspective: acquisition would be the gradual change in the distribution of I-language grammars.

The Variational Model presupposes the learner's simultaneous access to several grammars with respect to particular syntactic domains. The number of possible human grammars is supposed to be finite. The model is in line with the strong continuity assumption: the learner has access to UG-defined grammars from the outset of the acquisition process. Each grammar is paired with a weight p, corresponding to the measure of prominence of a grammar in the learner's language faculty. The weight p changes during the learning process until reaching its ultimate value, which equals the distribution of the particular grammars in the target language. The approach is one of grammar competition. Grammars that succeed in analysing a sentence are rewarded and grammars that fail are punished. To parse an incoming sentence, one of the grammars is chosen randomly, but grammars with a higher weight are more likely to be chosen. Not all input sentences are relevant to the acquisition of particular grammatical phenomena and consequently not analysable with present grammars. Input sentences that can be analysed and that lead to changes in p are called signatures.

The model makes straightforward predictions with respect to the rate of learning. Each grammar has a penalty probability, which corresponds with its proportional distribution in the target-system. A grammar that is hardly or not at all represented in the target-system, as are bare nouns in French, has a high penalty probability and can be eliminated very fast. To give an example, let us assume that nominals have two possible representations in UG (cf. section 3): they may project to the NP-layer, or to the DP-layer. Let us call these possible representations G_{NP} and G_{DP}. G_{NP} and G_{DP} are competing grammars. G_{NP} is the only target-grammar. That is, nominals are used at target-level when the weight *p* of G_{DP} is 0 and *p* of G_{NP} is 1. S is a sentence. While all incoming sentences are of the form S_{NP}, the child's output should reflect that the grammar which is prevalent in the environment slowly rises to dominance and should roughly look as follows:

Early in acquisition:
S_{NP}, S_{NP}, S_{DP}, S_{DP}, S_{DP}, S_{NP} ...

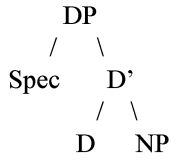
Intermediate in acquisition:
S_{NP}, S_{NP}, S_{DP}, S_{NP}, S_{NP}, S_{DP}...

Completion of acquisition:
S_{NP}, S_{NP}, S_{NP}, S_{NP}, S_{NP}, S_{NP}...

An immediately evident problem is that in reality children do not start off with the more complex DP-structure, especially in languages lacking articles, while the opposite has often been observed. The issue may be solved, however, by assuming that the child proceeds from the default option, which would be G_{NP}. At the outset of acquisition the weight of G_{NP} would be 1 and that of G_{DP} would be 0.

3. Preliminaries for the DP-domain

The present study is concerned with the acquisition of nominal syntax. Therefore, some clarification about the structure of nominals is appropriate. Since Sziabolcsi's (1983) and Abney's (1987) pioneering works, nominal utterances such as *the cat* are thought to have the syntactic structure in (3).[1]

(3)


Researchers in the generative field largely agree that determiners cannot be located in specifier positions but must head their own projections, as do other functional

[1] More elaborate structures have been proposed for nominals (see e.g. Giorgi & Longobardi (1991)) and what I am proposing is consistent with it, but for the present purpose only the NP and whether there is a DP above is relevant.

categories. However, there is no consensus about the structure of bare nominals, as e.g. in *I like cats*, nor about the question of whether nominals universally project to be DPs regardless of the presence of a determiner. This contribution is in line with the work of Chierchia (1998), Roeper & De Villiers (1995), Pérez-Leroux & Roeper (1999), proceeding from the assumption that NP and DP represent possible options in UG. In what follows, I will give some arguments in favour of this claim.

According to the *Correspondence Law* (Vergnaud & Zubizaretta 1992:612), the N-layer should be associated with *types* or *kinds* and the D-layer with *tokens* or *reference to specific individuals.* The authors were concerned with inalienable possessives in French, such as (4).

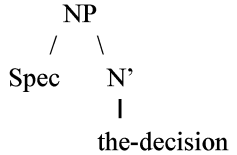
(4) Les hommes ont levé la main.
the men have raised the hand
"The men raised their hands." (Vergnaud & Zubizaretta 1992)

In the example, *la main*, a noun with a singular definite article, does not refer to any specific hand but has a type-reading, denoting the concept of hands in general. Although the Correspondence Law links the NP-DP distinction to the difference between specific and non-specific readings, Vergnaud & Zubizaretta do not consider a change in the phrase structure of the DP but assume that the definite article in cases like (4) is an expletive one that des not bear any denotational index. De Villiers & Roeper (1995) take a different position. They are also concerned with type-readings, but they argue that such nominals represent NPs rather than DPs.

Recall that the functional category DP constitutes a binding domain. De Villiers & Roeper show determiner-noun sequences for which this generalization does not hold, suggesting that their exceptional status is due to the missing DP-layer. The sentences in (5) contain a light-verb construction in which *the decision* has a type-reading. Under co-reference with *the boy*, the use of the pronoun *him* (which must be free in its binding domain according to Binding Principle B) is ungrammatical. By contrast, the use of the reflexive *himself* (which must be bound in its Binding Domain according to Binding Principle A) turns out to be fine, suggesting that *the boy* can bind *himself* despite of the intervening determiner-noun sequence.

(5) a. *The boy$_i$ made *the decision* to shave him$_i$.
b. The boy$_i$ made *the decision* to shave himself$_i$.

Provided that *the decision* represents an NP, the question about the position of the article arises. As specifier positions usually host maximal projections, the article is unlikely to occupy SpecNP. De Villiers & Roeper propose cliticization to the NP. Put differently, non-specific NPs may appear as NPs with cliticized articles, as in (6), while specific NPs require a DP.

(6)


Similar to light verb constructions, the existence of different possessive pronouns for bound and unbound readings in languages such as Swedish speaks in favour of the "NP-hypothesis". The Swedish possessive pronouns *hans/ hennes* "his/ her" cannot normally have a bound reading, as illustrated by the example (8). For a bound reading, the use of a reflexive possessive, such as *sin/ sitt* "his/ her", is required, as exemplified by (7).[2] It may be deduced that *hans* represents a DP and hence a barrier prohibiting a binding relation, while *sin* has the status of an NP and constitutes no barrier (see also De Villiers & Roeper (1995)).

(7) Lisa$_i$ klappar sin katt$_i$. (bound)
"Lisa caresses her (own) cat."

(8) Lisa$_i$ klappar hennes katt$_j$. (unbound)
"Lisa caresses her (=someone else's) cat."

The NP-hypothesis receives further confirmation from the *Inherent Binding Construction* (IBC) (Pérez-Leroux & Roeper (1999)). The IBC contains a bare nominal and is characterised by having an inherently bound interpretation for the possessor. For instance, the bare noun *home* in (9a) can only have a narrow scope reading: each fireman went to his own house. This distinguishes the IBC from a parallel construction containing an indefinite, as in (9b).

(9) a. Every fireman went home.
b. Every fireman went to a house. (Pérez-Leroux & Roeper (1999:2)

In contrast to full DPs, the modification possibilities of IBCs are restricted. Given that relative clauses and modifiers are attached at the DP-level, the reason why IBCs cannot take them must be the absence of the DP-layer (cf. (10-11a) vs. (10-11b)).

(10) a. Ellen visits a certain home.
b. *Ellen visits certain home.

(11) a. Ellen visits a home that sits near the lake.
b. *Ellen visits home that sits near the lake.
(Pérez-Leroux & Roeper (1999:6)

Abstract nouns display another argument against a universal DP. They cannot usually be combined with a possessive. As the position for an overt possessive is SpecDP (Valois 1991), the absence of DP would again provide an explanation. Note also that a definite or indefinite article is not allowed in these constructions.

(12) a. Maria hat Recht.
lit. "Mary has right."

[2] Note, however, that the use of *hans/deras* "his/their" to mean *sin/sina* has become very common in Spoken Swedish, especially among younger speakers.

b. *Maria hat ihr Recht.
lit. "Mary has her right."

(13) a. Maria hat Hunger.
lit. "Mary has hunger."
b. *Maria hat ihren Hunger.
lit. "Mary has her hunger."

(14) a. Maria hat gute Laune.
lit. "Mary has good mood."
b. *Maria hat ihre gute Laune.
lit. "Mary has her good mood."

In short, there is abundant evidence justifying that nominals do not always project to the DP-level. One may now further hypothesize that children initially follow principles of economy assuming that NP is the maximal projection for a noun. Roeper (1999) defines constraints on child language in terms of *Economy of Representation* (Chomsky (1995)). Accordingly, less structure and short movement are preferred over more structure and long movement if there is an option.

> "Whatever is a universal requirement of all languages cannot be omitted. Therefore each claim of minimalism must be defended. For instance, if Determiner Phrases are universally present above Noun Phrases, then they should not be omitted, but if languages allow NP to occur by itself [… this …] should be the first hypothesis." (Roeper 1999: 177).

This hypothesis is not inconsistent with the Variation Model, if we assume that the weights of G_{NP} and G_{DP} are initially set to a default value ($p_{NP} = 1$, $p_{DP} = 0$).

Another intuitive point in favour of the NP-option concerns the *Configurational Hypothesis* (Giorgi & Longobardi 1991:2). In stating that the structure of nominals parallels clause structure this idea played an important role when the DP-hypothesis was advanced. As for clauses, the left periphery is argued to have a complex structure, containing FinP and ForceP (Rizzi 1997). However, this complex structure may also be absent in some complement clauses, such as small clauses. If the parallel between clauses and nominals holds, the latter should not necessarily project the DP-layer.

In sum, there are a lot of arguments against a universal DP that is always projected. I will therefore depart from the assumption that NP and DP constitute possible representations for nominals in UG.

4. Determiner placement in the target-systems

This section deals with determiner omission in child-directed speech by adult speakers of French, Italian, and German. Simplifying, one may assume that each nominal syntagma that contains overtly realized material above NP leads to an increase of p_{DP}. It remains open whether the child can distinguish between nouns with a specific reading (projecting DP) and nouns with non-specific reading (not

projecting DP). For the moment, suppose that the child considers all nouns to be specific by default, with or without an article.[3] The portion of bare nouns is illustrated in Figure 1, which summarizes an investigation based on corpora of child directed speech containing between 2500 and 2700 nominal expressions per language. Proper names, compound nouns, and the expressions *faire mal, fare male* "hurt" are not included among the group of bare nouns. The penalty probabilities of the grammar competing with G_{DP} differ significantly ($p<0.001$) between each language pair (French/ Italian: $\chi^2=56.83$, df=1, N=5051; Italian/ German: $\chi^2=36.22$, df=1, N=5186).

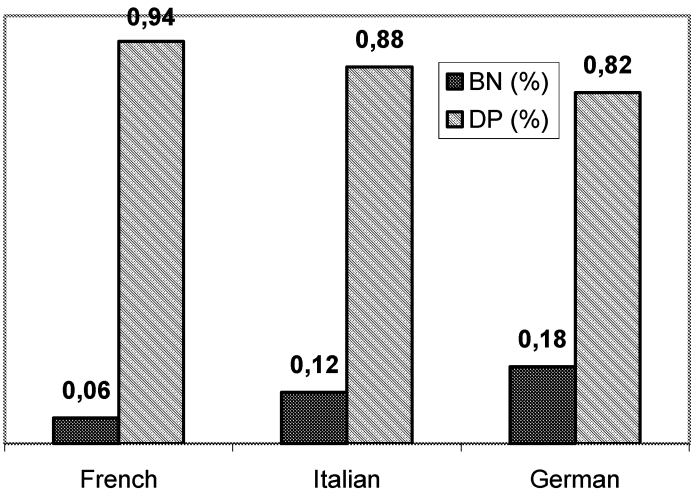


Figure 1: Distribution of bare nouns in child-directed adult speech

Given these penalty probabilities, the Variational Model makes clear and testable predictions for the rate of learning across languages. Since G_{NP} has the highest penalty probability in French, French children should converge to the target before Italian and German children. Italian children use determiners at target-level before German children. In section 5 we will show that this is borne out.

5. Determiner omission in acquisition

A number of studies have focussed on determiner acquisition in monolingual German, French, and Italian (see e.g. Eisenbeiss (2000) for German, Granfeldt (2003) for French, Bottari et al. (1993/94), Pizzuto & Caselli (1992), and Antelmi (1997) for Italian)). Comparing across studies, it seems that determiners appear earlier in the speech of children acquiring a Romance language than in children

[3] This is a plausible assumption, since before age 2;6 children predominantly use Det+N sequences in referring to specific individuals, present and mostly visible in the extra-linguistic context. It is not clear whether the first determiners already encode specificity or whether they are only used to mark gender or agreement. Children may not be able makes the specific/ non-specific distinction, as it hinges on complex semantic and pragmatic knowledge. Possibly, the system is bootstrapped merely by surface structure.

acquiring a Germanic language, but different counting and evaluation procedures call for caution in drawing ultimate conclusions. Evidence is, however, also provided by cross-linguistic studies, in particular by Chierchia et al. (1999), Lleó & Demuth (1999), Guasti & Gavarró (2003). Clearly, children cease to omit earlier in the Romance languages than in the Germanic ones, while it is less clear whether the same asymmetry applies to the moment when determiners are ultimately used at target-levels (cf. Kupisch 2003).

5.1 Determiner omission in bilingual German/French and German/Italian

The following data have been collected in a research project on early bilingualism, comparing German-Italian and German-French bilinguals. The project is directed by Natascha Müller and it is associated with the acquisition group at the *Research Center on Multilingualism* in Hamburg, Germany. The children come from binational families in Hamburg. All have German-speaking fathers; their mothers are either French or Italian. Video-recordings have usually been conducted bimonthly from the age of between 1;6 and 2;2 until the age of 5. Two of the children are still in the process of being recorded. The investigation covers the period between the earliest recordings available until age 3, when determiner omission has normally stopped. The sessions took place at the children's homes. They were conducted by native speakers and contain between 30 and 45 minutes of spontaneous interaction in each language.

As the study deals with bilingual data, an important point to be addressed relates to language balance. Given the paper makes a statement about cross-linguistic variation, it is important to ensure that the behaviour of bilinguals mirrors that of monolinguals. As Meisel (1990:17) points out, "bilingual first language development does not differ in substantial ways from monolingual development". Many researchers share this opinion, but it is taken to imply *simultaneous* and *balanced* bilingualism. *Unbalanced* bilingualism, by contrast, is still a matter of debate. In particular, opinions vary regarding the question of whether the "weaker language" is merely quantitatively different from monolingual acquisition and retarded with respect to age, as argued by Müller & Kupisch (to appear), or whether it is qualitatively different and has traits of second language acquisition, as proposed by Schlyter and colleagues (e.g. Schlyter 1994). To circumvent the issue, I excluded the language developing more slowly with an average MLU difference of more than 0.3 in the investigated time span.[4] An overview of the corpora finally chosen is provided in Table 1 (a star indicates that only one language was analysed).

The investigation aimed at a comparison of determiner omission in the bilingual children across languages. Though there may be inter-individual differences, a comparison with respect to age was favoured over an MLU-based one because the languages differ in terms of what they realize as free morphemes. To give an

[4] It is often argued, and I agree on this point, that MLU is a necessary but insufficient criterion to measure language proficiency. In fact, other criteria, such as the number of utterances and the longest utterance per session, the increase of verb types and language mixing have been analysed as well and let to similar findings (cf. Kupisch & Müller (2002), Müller & Kupisch (to appear)).

example, the question *where does he go?* consists of two words in Italian (15a), three in German (15b), and six in French (15c).

(15) a. Dove va?
b. Wohin geht er ?
b. Où est-ce qu'il va?

Therefore, at a comparable point of their linguistic development children acquiring French may have higher MLU-values than children acquiring Italian.

Italian (+German)	French (+German)	German (+Italian)
Lukas (1;8-3;0)		Lukas (1;8-3;0)
Carlotta (1;8-3;0)		Carlotta (1;8-3;0)
Marta* (1;6-3;0)	Alexandre* (2;2-3;0)	Jan* (2;0-3;0)
Aurelio* (1;9-3;0)	Amélie* (1;6-2;6)	

Table 1: Overview of investigated corpora

Omission rates have been established based on the absolute number of determined nouns as opposed to illicit determiner omissions. Bare nouns that are licensed in the target language, as e.g. post-verbal mass and plural objects with nonspecific reference (or with unclear reference) have not been considered in German and Italian. The same holds for imitations, both with or without determiner, and uncertain cases, such as *der geht in kranknhaus* "he goes to (the) hospital", where the preposition *in* could possibly be a contraction of the preposition *in* and the article *den*, encoding a target-deviant case. The percentages were calculated for a two-month-span. The results are shown in Figure 2.

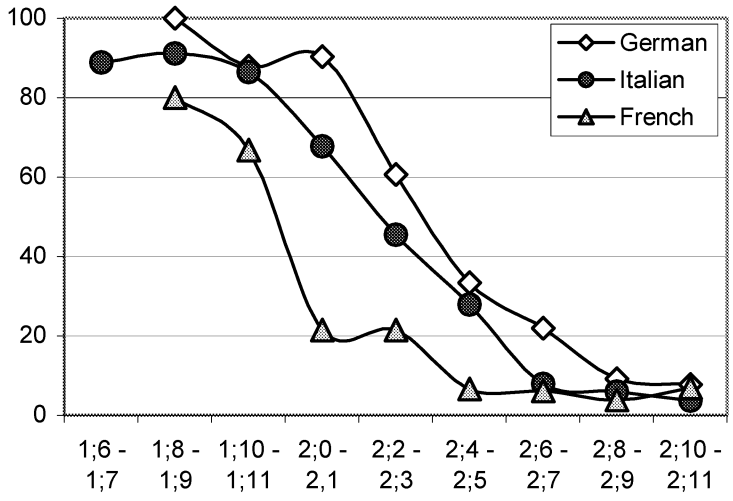


Figure 2: Determiner omission across languages

The order of convergence to the target is first French, then Italian, and finally German, as predicted by the Variational Model. Language differences were controlled by means of a χ^2-test with respect to three phases: age 1;8 to 2;2, age 2;3 to 2;7, and age 2;8 to 3;0 (see Table 2 below). The results were highly significant ($p<0.001$) for each individual difference in Phase 1 (French/ Italian: $\chi^2=188.03$, df=1, N=1248; Italian/ German: $\chi^2=51.97$, df=1, N=1414) and in Phase 2 (French/ Italian: $\chi^2=57.28$, df=1, N=2914; Italian/ German: $\chi^2=33.47$, df=1, N=2629). In Phase 3 only the contrast between Italian and German reached a significant ($p<0.01$) value (French/ Italian: $\chi^2=0.12$, df=1, N=2345; Italian/ German: $\chi^2=7.70$, df=1, N=2975; German/ French: $\chi^2=2.43$, df=1, N=1652). I take this to suggest that the children have already converged to the target in Phase 3. Cross-linguistic differences are greater between French and Italian than between Italian and German (the divergence is obviously greatest between German and French). The contrast is more clearly pronounced in the two earlier stages and tends to disappear in Phase 3. An overview is provided in Table 2.

age	Phase 1 1;8 - 2;2	Phase 2 2;3 - 2;7	Phase 3 2;8 - 3;0
German	91.8%	30.2%	7.4%
Italian	75%	20.3%	4.9%
French	29.1%	10%	5.3%

Table 2: Determiner omission across languages

6. Conclusion

In this article I have given evidence for cross-linguistic differences in the acquisition of determiners between "Romance" on the one hand and "Germanic" on the other hand, but also among the Romance languages. The variational approach to language acquisition predicts these differences. The investigation was based on the token-frequency of determined as opposed to bare nouns. As for the Romance-Germanic contrast, the results are in keeping with previous research, but unlike other studies (e.g. Chierchia et al. (1999)), the present study also uncovered a difference among the Romance languages. Furthermore, differences mainly concerned the earlier phases.

Nevertheless, two questions have remained open. Firstly, there are alternative possibilities to explain the results. Lleó & Demuth (1999) predict the Germanic-Romance asymmetry based on a prosodic model. It is not clear however, whether the model makes the correct predictions for French. French is similar to Spanish and Italian in that articles are proclitic to the noun, but the stress pattern on nouns should not promote an early acquisition, compared e.g. to Italian. Another possible explanation for cross-linguistic differences is that determiner acquisition is bootstrapped by gender properties. This is not unlikely because children acquiring French and Italian start to encode gender at a very early age. One would however expect that Italian children are faster than French children, because the Italian gender system is more transparent than the French one (cf. Kupisch et al. 2002). Both possibilities have to be explored in more detail in future research.

Secondly, I cannot exclude the possibility that the acquisition process illustrated here involved language influence. While nowadays most researchers working on bilingual acquisition agree that bilingual children are capable of separating the two grammatical target-systems, more recent investigations have shown that there may be language influence despite of language separation (e.g. Gawlitzek-Maiwald & Tracy 1996, Hulk & Müller 2000). In particular, if two languages overlap with respect to the properties of a grammatical domain, language A may influence language B positively or negatively and accelerate or slow down the acquisition of that grammatical property (Müller et al. 2002). While language influence is unlikely to appear in the four more unbalanced children, as the direction would be from weaker to stronger language, it could have played a role in the acquisition process of Lukas, and especially Carlotta. In fact, evidence for language influence in Carlotta was provided in previous studies (Müller et al. 2002). Influence in the two balanced bilinguals would also explain the relative "nearness" of the Italian and the German acquisition curves. Further research will be done on monolingual data to see whether the results obtained here can be repeated.

The study proceeded from the assumption that children are equipped with coexisting structures, NP and DP, from the start. However, the fact that determiners tend to be omitted initially speaks in favor of a default setting in the sense that the weights of G_{DP} and G_{NP} are preset to 0 and 1 respectively. The default corresponds to the structurally less complex and more economical option. This assumption is in line with the idea that child language is guided by Economy of Representation and meets one the core ideas of the Minimalist Program. Lastly, it may still be the case that children's earliest determiners do not imply an underlying DP-structure. They could be memorized-strings or gender markers (implying that the child projects up to an intermediate level between NP and DP). Both options do not imply the semantic and pragmatic knowledge of specificity associated with the D-level. To approach this issue a fine-grained analysis of children's early determiners is required.

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Adult L2 Acquisition of Italian Clitic Pronouns and 'Subject Inversion'/VS Structures

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1. Introduction

In this paper we will be primarily concerned with the acquisition of object clitic pronouns by a group of adult L2 learners of Italian with different L1s[1]. The ultimate aim of our research is the adult L2 acquisition of Italian subject inversion structures displaying the VS order. However, since 'subject inversion'/ VS structures, V a transitive verb, typically realize the direct object as a clitic pronoun in Italian, as the examples in (1) illustrate:

(1) a. Chi ha portato i fiori?
"Who brought the flowers?"
b. Li ha portati Silvia
Them(cl) brought Silvia
"Silvia brought them"

The study of the level of acquisition of object clitics comes logically first. Hence, we will primarily analyse here the interlanguage grammars of the L2 group with respect to the ability in producing object clitics in different contexts. An elicitation task procedure will be used, described in section 3.1. Finally, a similar experimental procedure will be introduced to detect the mastering of subject inversion/VS structures.[2]

The paper is organized as follows: in section 2 a detailed description of the population taking part into the experiments is provided; section 3.1 supplies methodological information about the experiment on clitics production; the results of this experiment are analysed in section 3.2; section 4 focuses on the experiment on the elicitation of subject inversion VS structures; section 5 concludes the paper.

2. Participants

The population participating in the experiment was constituted in the vast majority by visiting students (24 out of 26) of the University of Siena; their age

[1] The investigation of adult L2 learners' developing grammars has been the centre of much recent research and has largely contributed to the field of L2 acquisition. Of key interest has been the question whether adult L2 acquisition exhibits patterns similar to L1 acquisition and to child L2 acquisition as well as whether the L1 grammar influences L2 acquisition.

White (2003); Schwartz (1998) and references cited therein especially relevant for the issue on the influence of the L1 on the L2.

[2] See Belletti and Leonini (2003), (ms. University of Siena, (submitted)) for a more detailed analysis and discussion of this experiment.

ranged between 19 and 34 y.o. The subjects had had from a minimum of 6 months to a maximum of 63/72 months of study of Italian in their native country (the latter in three cases only). None of the subjects, however, had had any early exposure to Italian. Their permanence in Italy ranged from 1 month to 5/6 years (two cases).
The 26 L2 learners of Italian had different L1s. The biggest group was constituted by native speakers of German.
The whole population consisted of: 16 Germans (G); 3 French (F); 2 Polish (P); 1 Dutch (D); 1 Russian (R); 1 Greek (Gr); 1 Albanian (Al); 1 Bosnian (Bo).

More detailed information on the L2 subjects are summarized in Table 1 in the Appendix. 10 adult native speakers of Italian served as a control group. They came from different regions in Italy; all of them were living in Siena, where they have been tested. Their age ranged between 22 and 33 y.o.

3. The elicitation of clitic pronouns

3.1 Experimental design

19 videos describing different scenes were shown to the 26 subjects. At the end of each video a question was asked concerning the scene; the subjects had been instructed to always answer with a full sentence containing the verb, in the way they felt most natural. Some distractor scenes were also inserted[3]. To exemplify, object clitics have been elicited through questions related to the scenes of the type in (2):

(2) a. Il ragazzo che cosa ha fatto con la carta?
The boy what has done with the paper?
"what has the boy done with the paper?"
Expected answer:
b. L'ha buttata nel cestino
It(cl) has thrown away in the basket
"he has thrown it away in the basket"

An object clitic was expected in 23 contexts.

3.2 Results

Table 1 below illustrates the general results on the clitic elicitation experiment. As shown in the Table, use of clitics is not acquired properly: clitics are often omitted and, even more often, the complement is realized as a full lexical noun phrase; use of a strong pronoun in place of the clitic appears to be quite limited. We interpret the use of a full lexical noun phrase as a complement in place of the clitic as a strategy to avoid use of a clitic pronoun which the elicitation task brings to light in a sharp way.[4]

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[3] Subjects were tested individually. They took approximately 10-15 minutes to complete each task. Their responses were recorded and then transcribed. Only full sentences containing a verb were considered, while repetitions were discarded.

[4] The elicitation procedure makes the strategy emerge in a clearer way than simple natural production data (see Duffield et alii for related discussion on this point)).

Sub-jects	Clitic present		Clitic omitted		Lexical NP		Strong Pronoun		Incomplete answers	
1	**4%**	1*	**13%**	3	**65%**	15	**4%**	3;1*	**4%**	1
2	**4%**	1*	**22%**	5	**70%**	16,1*	**0**	0	**4%**	1
3	**91%**	21;1*	**4%**	1	**0**	0	**0**	0	**4%**	1*
4	**91%**	21;1*	**4%**	1	**0**	0	**0**	0	**4%**	1*
5	**0**	0	**0**	0	**91%**	21;2*	**0**	0	**9%**	2
6	**0**	0	**17%**	4;1*	**56%**	13	**4%**	1*	**22%**	5
7	**35%**	8;2*	**26%**	6	**26%**	6	**9%**	2	**4%**	1
8	**22%**	5	**9%**	2	**56%**	13;1*	**0**	0	**13%**	3;1 *
9	**0**	0	**48%**	11;1*	**39%**	9	**0**	0	**13%**	3;1 *
10	**96%**	22;2*	**0**	0	**0**	0	**0**	0	**4%**	1
11	**70%**	16;2*	**0**	0	**30%**	7	**0**	0	**0**	0
12	**9%**	2*	**0**	0	**83%**	19	**4%**	1	**4%**	1
13	**74%**	17;1*	**13%**	3,1*	**9%**	2	**0**	0	**4%**	1
14	**9%**	2*	**26%**	6	**65%**	15	**0**	0	**0**	0
15	**87%**	20;2*	**0**	0	**13%**	3	**0**	0	**0**	0
16	**96%**	22;2*	**0**	0	**0**	0	**0**	0	**4%**	1
17	**78%**	18;2*	**0**	0	**9%**	2	**4%**	1	**9%**	2
18	**69%**	16;2*	**9%**	2	**13%**	3	**0**	0	**9%**	2
19	**52%**	12;1*	**9%**	2	**35%**	8	**0**	0	**4%**	1*
20	**4%**	1*	**13%**	3	**69%**	16	**0**	0	**13%**	3;1 *
21	**78%**	18;2*	**0**	0	**13%**	3	**0**	0	**9%**	2
22	**13%**	3;2*	**30%**	7	**52%**	12	**4%**	1	**0**	0
23	**17%**	4;2*	**35%**	8	**48%**	11	**0**	0	**0**	0
24	**9%**	2*	**26%**	6	**65%**	15	**0**	0	**0**	0
25	**9%**	2;1*	**17%**	4	**74%**	17;1*	**0**	0	**0**	0
26	**0**	0	**35%**	8;1*	**61%**	14;1*	**4%**	1	**0**	0

* = Clitic present in the question

Table 1: Production of Clitic pronouns in L2 Subjects

A total lack of misplacement errors of clitics in the provided answers should also be pointed out; it contrasts with some findings in the (child and adult) L2 acquisition of object clitics in French (Belletti & Hamann to appear, Granfeldt & Schlyter to appear, Hamann & Belletti to appear, Hulk 2000 and references cited there). With the L2 subjects investigated here, when produced, clitics are always located in the appropriate pro-clitic position (with tensed verb forms). Of course, more data on adult L2 acquisition of clitics in Italian is necessary to determine the general character of this result.

Overall, our findings appear to be directly compatible with the so called 'No Impairment' hypothesis (Duffield et alii 2002, Schwartz & Sprouse 1996, Schwartz 1998, White 2003), particularly relevant in the case of the German subjects, all at a

relatively non-advanced level in the acquisition of Italian (with the only exception of subject 18).

Table 1 sharply contrasts with Table 2 reporting the responses of the control group to the same elicitation test.

Subjects	Clitic present	Clitic omitted	Lexical NP	Strong Pronoun	Incomplete answers
1	**87%** 20;2*	**0**	**13%** 3	**0**	**0**
2	**100%** 23;2*	**0**	**0** 0	**0**	**0**
3	**87%** 20;2*	**0**	**9%** 2	**0**	**4%** 1
4	**83%** 19;2*	**0**	**13%** 3	**0**	**4%** 1
5	**83%** 19;2*	**0**	**13%** 3	**0**	**4%** 1
6	**91%** 21;2*	**0**	**9%** 2	**0**	**0**
7	**96%** 22;2*	**0**	**4%** 1	**0**	**0**
8	**100%** 23;2*	**0**	**0** 0	**0**	**0**
9	**96%** 22;2*	**0**	**4%** 1	**0**	**0**
10	**87%** 20;2*	**0**	**13%** 3	**0**	**0**

Table 2: Production of clitic pronouns in control subjects

Note the total lack of clitic omissions and use of strong pronouns in the control group. Use of full lexical noun phrases is also extremely limited. This indicates that use of a full lexical noun phrase as a complement can be interpreted as an effect of the experimental design only to a very marginal extent. This in turn supports our interpretation above for the "overuse" of lexical noun phrases in the L2 (German) subjects as an avoidance strategy.

As not all subjects show clitic omissions, we can group them accordingly. We obtain the results summarized by the percentages in Table 3, visualized by Figure 1. Table 4 and the related Figure 2 illustrate the very different performances of the control group.

Subjects	Clitic present	Clitic omitted	Lexical NP	Strong Pronoun	Incomplete answers
With clitic omiss	28%	20%	45%	2%	6%
With no clitic omiss	64%	0	30%	1%	5%
All subjects	39%	14%	40%	1,7%	5,5%

Table 3: Total of percentages of clitic use in L2 subjects

Subjects	Clitic present	Clitic omitted	Lexical NP	Strong Pronoun	Incomplete answers
Control	91%	0	7,7%	0	1,3%

Table 4: Total of clitic use in the Control Group

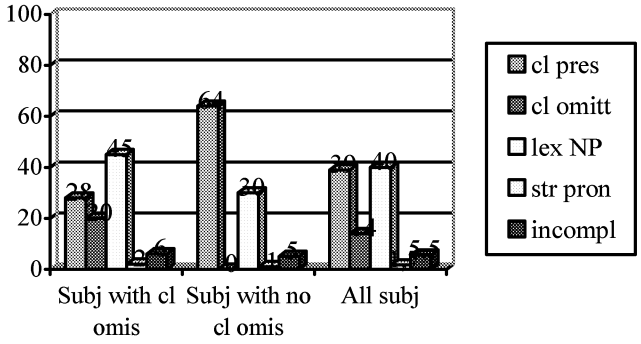

Figure 1: Clitic use in L2 Subjects

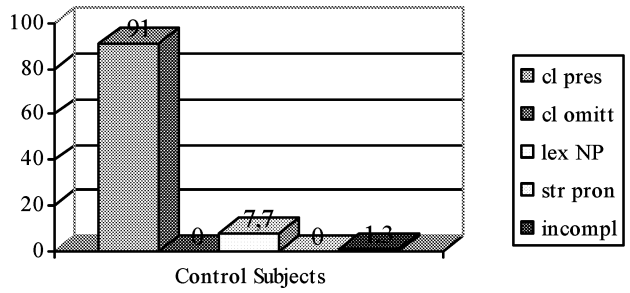

Figure 2: Clitic use in Control Subjects

We first note the sharp difference in the behaviour of the control group with respect to the first group of Figure 1 as no clitic omission is produced by control subjects. Second, we point out interesting differences in the shape of Figure 2 with respect to the second group of Figure 1. Although the second group of Figure 1 has a relatively high percentage of clitic use, still this use remains lower than the one of the control group; on the other hand, use of full lexical NP-complements is much higher in the second group of Figure 1 than in the control group. This again suggests that use of a full lexical NP-complement qualifies as a strategy to avoid use of a clitic pronoun to a certain extent (note that the almost 30% difference in clitic use between the control group and the second group of Figure 1 corresponds to the percentage of use of full lexical NP complements in the latter group).

Finally, it should be pointed out that the shape of the first group of Figure 1 essentially corresponds to the behaviour of the German group, as is illustrated by Table 5 and Figure 3:

Subjects	Clitic present	Clitic omitted	Lexical NP	Strong Pronoun	Incomplete answers
German	22%	20%	51%	2%	5%

Table 5: Percentages of clitic use in Subjects with L1 German

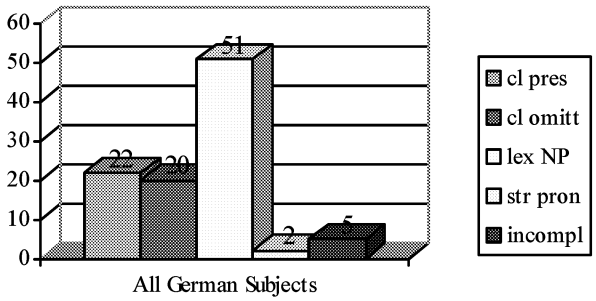

Figure 3: Clitic use in Subjects with L1 German

4. The elicitation of 'subject inversion'/VS structures

4.1 The experimental design

To the same 26 adult subjects a further experimental task has been proposed in order to elicit structures with 'subject inversion', displaying the VS order. 22 videos have been shown to the subjects. As usual, distractors were interspersed among the relevant scenes. The structures were elicited by asking questions containing verbs of different verb classes of the type illustrated in (3). The subjects were asked to answer with a full sentence containing the verb, in the way they felt as the most natural one[5]. Some examples of the elicited answers are given in (4):

(3)	a.	Chi	è	arrivato?		unaccusative
		Who	has	arrived?		
	b.	Chi	ha	tossito?		intransitive
		Who	has	coughed?		
	c.	Chi	ha	preparato	il caffè?	transitive
		Who	has	prepared	the coffee?	
	d.	Cosa	c'è	sopra il	tavolo?	existential 'ci'
		What	is	on the	table?	

(4) a. E' arrivato Francesco
is arrived Francesco
"Francesco arrived"

b. Ha tossito la ragazza
has cough the girl
"the girl cough"

[5] The current experiment differs from the previous one for the fact that this time the subject was instructed to answer first to a question asked at the end of each scene by one of the characters of the video and then to some other questions related to the scene proposed by the presentation after each video. The subjects were asked to answer with a full sentence containing the verb, in the way they felt the most natural one.

c. L'ha preparato la mamma
it(cl)has prepared the mother
"the mother prepared it"
d. C'è un piatto
there is a plate

In all the elicited answers the postverbal subject is interpreted as the Focus of new information. With this interpretation, the subject is assumed to fill a clause internal dedicated position in the VP periphery in Italian along the lines proposed in Belletti (2001, 2002, and references cited there).[6] As before, the same elicitation test has been proposed to the 10 control subjects, native speakers of Italian.

4.2 Results on 'subject/inversion'/VS structures

The general very neat result is that the L2 subjects do not master the VS order. The following Table 6 and the related Figures 4 comparing the performances of the L2 group with the performances of the control group show it very clearly. While the subject inversion structures are produced in almost 100% of the elicited contexts by the control group, they are produced at a roughly chance level by the L2 group who produces the SV order to a comparable extent.

Subjects	VS ok		*SV		Other	
All L2 subjects	43%	432/1016	45%	458/1016	12%	126/1016
Control group	98%	381/390	1%	5/390	1%	4/390

Table 6: VS/SV

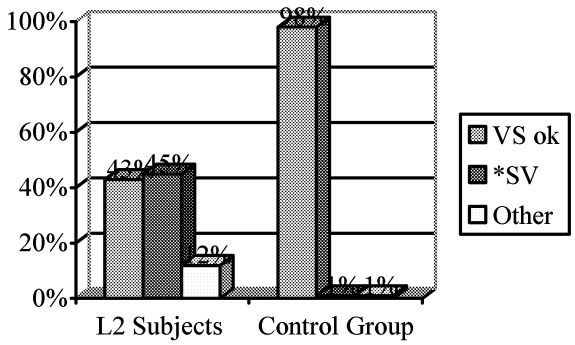

Figure 4: VS-SV in L2 Subjects and in Control Group

[6] Zubizarreta (1998), Ordoñez (1998) for related discussion.

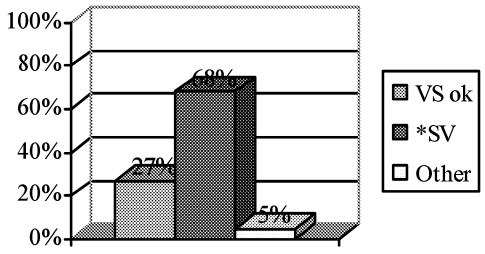

Figure 5: VS-SV in the German group

Let us compare the performances of the different L2ers based on their L1. As illustrated in Figure 5, the German group reproduces in a sharper way the general results of the overall L2 group (cfr. the detailed table in the Appendix):

As a matter of fact, the shape of Figure 4 is primarily affected by the very good performances of L2 subjects with an L1 other than German, whose answers essentially conform to the control group (see Appendix). We divided these speakers into two subgroups: one including the Albanian, the Bosnian and the Greek subjects, the other including the Polish and the Russian ones. The performances of these two groups could be influenced by their L1 in that the VS order would also be likely to be produced in the same pragmatic contexts identified by the elicitation test. This is clearly not the case for the German group, as German lacks any subject inversion phenomenology comparable to the one found in Italian.[7] This is probably one crucial factor distinguishing the behaviour of the three groups. On the other hand, it should also be pointed out that the L2 speakers of the two subgroups above are by far the most fluent ones in Italian. As for the German group, only a small subset of subjects appears to be comparably fluent.

It is also of interest to compare the percentage of clitic use and the percentage of production of the VS order in some detail in the German group: both are low and they are extremely close to each other (22% and 27%, respectively). This seems to suggest that both domains are more or less at the same stage of attainment in the interlanguage of the German subjects.

That the L1 could influence the L2 performance (of not particularly fluent L2ers) is further illustrated by the peculiar behaviour of the French group, shown in Figure 6:

[7] Which, as we are assuming, makes use of clause internal dedicated positions.

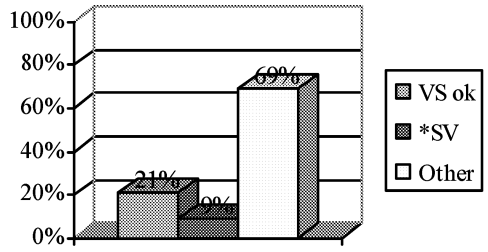

Figure 6: VS-SV in the French Group

The striking fact illustrated by Figure 6 is the high use of what we label 'other'. In the French group 'other' systematically corresponds to a Cleft sentence (79 out of 81 performed utterances = 98% of the cases). A Cleft sentence would precisely be the structure typically produced in French in the same contexts. The answers provided by French subjects to a question like (5) are given in (6):

(5) Chi ha mangiato la mela?
Who has eaten the apple?

(6) a. E' una donna che ha mangiato la mela (Subject 11; Subject 17)
it is a woman who has eaten the apple
b. E' la mamma che ha mangiato la mela (Subject 12)
it is the mother who has eaten the apple

If we now consider the different verb classes present in the elicitation task, we observe that this does not appear to be a crucial factor conditioning the performances of the different L2 groups: as pointed out above, VS is generally problematic, independently of the class to which the verb belongs. This is illustrated in some detail in Table 7[8]:

Order	Intransitive		Unaccusative		'Ci' existential		Transitive	
VS	**35%**	90/257	**41%**	42/102	**96%**	131/137	**32,5%**	169/520
	8%	other	2%	Other	4%	Other	3%	other
*SV	**51%**	132/257	**54%**	55/102	**0**		**52%**	271/520
	6%	other	2%	other			12,5%	other

Table 7: VS-SV and different verb classes in L2 group

[8] Note however that for both the German and the French groups the use of VS order is higher with unaccusative verbs than with intransitive and transitive ones.

As for the case of transitive verbs, we may further note that, although the necessity to use a clitic pronoun for the object in VS structures containing verbs of this class may possibly constitute a factor of complexity, yet it does not appear to play the central role in the limited production of a word order which is hardly available anyway.

Finally, the case of the existential 'ci' construction must be singled out: all L2 speakers produce the VS order in this case (131 out of 137 answers = 96%), with no difference depending on the L1.

5. Summary and Conclusion

The investigation undertaken in this work on the L2 acquisition of clitic pronouns and subject inversion/VS structures in Italian has indicated the following:

- as for the German group:

i. cltic production is limited;

ii. use of a clitic pronoun appears to be avoided in part through omission, but most of all through use of a full lexical noun phrase as a complement;

- throughout the L2 group:

i. clitics typically appear to be more readily available in dependence of presence of Romance type clitics in the L1;

ii. use of a full lexical NP appears to be a prominent strategy to realize the complement of the verb in place of a clitic;

iii. use of strong pronouns in place of a clitic is extremely limited.

- As for the German and French group:

i. VS order is produced at a low rate, independently of the verb class (with the exception of "Ci" existential constructions);

ii. the informational /discourse value of the Italian VS order is typically obtained through resort to the L1 strategy (SV order for the German group; a Cleft sentence for the French group), thus producing an instance of Transfer.

6. Appendix

Subject	Age	L1	Study in the native country	Permanence in Italy
1	22	German	9 months	7 months
2	25	German	6 months	6 months
3	22	Russian	3 months	13 months
4	22	Polish	36 months	11 months
5	24	German	18 months	2 months
6	24	German	27 months	2 months
7	21	German	27 months	1 ½ months
8	23	Dutch	18 months	10 months
9	22	German	9 months	1 ½ months
10	22	Polish	63 months	1 month
11	22	French	45 months	1 month
12	21	French	45 months	1 month

13	22	Bosnian	36 months	1 month
14	23	German	9 months	2 months
15	31	German	1 month*	1 month
16	19	Albanian	9 months	2 months
17	22	French	63 months	4 months
18	35	German	36 months	6 years
19	24	Greek	6 months	5 years
20	22	German	6 months	1 month
21	23	German	27 months	6 months
22	23	German	18 months	3 months
23	21	German	18 months	3 months
24	22	German	18 months	6 months
25	22	German	6 months	3 months
26	23	German	72 months	3 months

*This subject had a very good knowledge of Spanish (15 years of study at school)

Table A: L2 Subjects

The German group, which constitutes the biggest one, is highlighted in Table A.[9]

Subj	L1	VS ok		*SV		Other	
1	G	(24/40)	**60%**	(10/40)	**25%**	(6/40)	**15%**
2	G	(6/40)	**15%**	(34/40)	**85%**		**0**
3	R	(33/39)	**85%**		**0**	(6/39)	**15%**
4	P	(36/39)	**92%**		**0**	(3/39)	**8%**
5	G	(6/39)	**15%**	(33/39)	**85%**		**0**
6	G	(4/39)	**10%**	(31/39)	**79%**	(4/39)	**10%**
7	G	(5/39)	**13%**	(34/39)	**87%**		**0**
8	D	(27/39)	**69%**	(9/39)	**23%**	(3/39)	**8%**
9	G	(6/39)	**15%**	(31/39)	**79%**	(2/39)	**5%**
10	P	(36/39)	**92%**	(1/39)	**3%**	(2/39)	**5%**
11	F	(11/39)	**28%**	(4/39)	**10%**	(24/39)	**62%**
12	F	(6/39)	**15%**	(6/39)	**15%**	(27/39)	**69%**
13	Bo	(33/39)	**85%**	(6/39)	**15%**		**0**
14	G	(5/39)	**13%**	(34/39)	**87%**		**0**
15	G	(35/39)	**90%**	(3/39)	**8%**	(1/39)	**3%**
16	Al	(38/39)	**97%**		**0**	(1/39)	**3%**
17	F	(8/39)	**21%**	(1/39)	**3%**	(30/39)	**77%**
18	G	(19/39)	**49%**	(17/39)	**44%**	(3/39)	**8%**
19	Gr	(37/39)	**95%**	(2/39)	**5%**		**0**
20	G	(5/39)	**13%**	(31/39)	**79%**	(3/39)	**8%**
21	G	(16/39)	**41%**	(23/39)	**59%**		**0**

[9] Note that, overall, the length of study of Italian in the native country does not necessarily affect the performance in the test, while length of permanence in Italy probably does. This is suggested by the performance of the two subjects who have been living in Italy for the longest periods (subjects 18 and 19).

22	G	(5/39)	**13%**	(32/39)	**82%**	(2/39)	**5%**
23	G	(5/39)	**13%**	(33/39)	**85%**	(1/39)	**3%**
24	G	(9/39)	**23%**	(27/39)	**69%**	(3/39)	**8%**
25	G	(12/39)	**31%**	(24/39)	**62%**	(3/39)	**8%**
26	G	(5/39)	**13%**	(32/39)	**82%**	(2/39)	**5%**
Total of all L2 subjects		(432/ 1016)	**43%**	(458/ 1016)	**45%**	(126/ 1016)	**12%**
German		(167/ 626)	**27%**	(429/ 626)	**68%**	(30/ 626)	**5%**
French		(25/ 117)	**21%**	(11/ 117)	**9%**	(81/ 117)	**69%**
Albanian, Bosnian, Greek		(108/ 117)	**92%**	(8/117)	**7%**		**0,9%**
Russian, Polish		(105/ 117)	**90%**	(1/117)	**0,9%**	(11/ 117)	**9%**

Table B. VS - SV in L2 subjects

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Young Children's Understanding of Ongoing vs. Completion in Present and Perfective Participles

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1. Introduction

There has been a vast amount of cross-linguistic research on the morphology of the grammatical aspect especially with respect to the perfective-imperfective distinction, starting with Brown (1973) and de Villiers and de Villiers (1973). Children's comprehension of perfective-imperfective distinction is discussed in Weist, Sysocka & Lyytinen (1991), van Hout (in press), Vinnitskaya & Wexler (2001), Wagner (2002) and others. However, not much research has been carried out on the acquisition of present and perfective participles.

Examples of the present and perfective participles that we are concerned with in this paper are listed in (1a) and (1b):

(1) a. burning candle / boiling water / melting ice cream (present participles)
b. burned candle / boiled water / melted ice cream (perfective participles)

The difference between (1a) and (1b) is intuitively very simple; in the first case, the candle must be in the middle of burning, whereas in (1b), the burning must be over. Klein (2002) argues that the addition of the *-ing* morpheme selects a subinterval of the verb stem, whereas, "the post time introduced by *-ed* overlaps with the second time in verb stems". Bresnan (2000) and Haspelmath (1993) point out that almost any verbs may undergo adjective conversion with the present participles, but that only telic verbs can appear as perfective participles; see (2) and (3):

(2) a. wilting lettuce — lettuce that is wilting (telic)
b. running child — child who is running (atelic)

(3) a. wilted lettuce — lettuce that has wilted
b. *run child — child who has run

Klein (1994; 2002) proposes that telic and atelic verbs have different 'argument-time' structures. Telic verbs such as *wilt* and *elapse* have '2-state contents': a source state and a target state. The post time of 'the lettuce wilted' is characterized by 'wilted lettuce' as in (3a). By contrast, atelic verbs have '1-state contents', which are not compatible with *-ed*. The post time of 'the child ran' cannot be characterized by 'the run child' as in (3b). This is because *-ed* picks out the second time variable and the verb *run* does not include this second time variable or the target state.

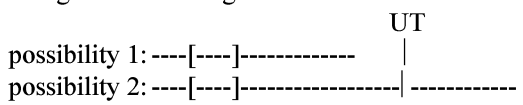
Weist, Sysocka and Lyytinen (1991) and Wagner (2002) investigated children's comprehension of the perfective-imperfective distinction in examples such as (4a) and (4b):

(4) a. The girl was drawing a flower.
b. The girl drew a flower.

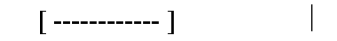
Weist, Sysocka and Lyytinen (1991) found that English and Polish children as young as 2;6 succeeded in a forced-choice sentence-to-scene matching experiment. These young children correctly matched a picture of an incomplete event to (4a) and a picture of a completed event to (4b). Wagner (2002), however, argues that in her experiment, children had to be at least 5 years old to succeed in matching (4b) to a picture of a completed event. Wagner (2002) argues that the participants in Weist, Sysocka and Lyytinen's (1991) experiment performed better at a younger age because they were given cues about the intention of the agent. The pictures used in the experiment included a smiling girl next to a completed event (the girl was happy to finish drawing a flower). In the incomplete picture, there was a girl who was in the middle of drawing a flower. Wagner (2002) proposes that young children are extremely sensitive in assessing the intention of agents; hence, the pictures of the agent helped the participants to perform well in the experiment. In Wagner's (2002) new study, there was no picture of an agent. For example, only the pictures of two flowers would have been shown in the stimuli such as (4) (Wagner used a sentence 'draw a face' in her experiment). The participants were not given any cue about the intention of the agent and the younger participants (ages 2 to 4) failed in matching a picture of a completed event to a sentence such as (4b). In the experiments reported in this paper, we followed Wagner (2002); no cues were given about the agents of completed and incomplete events.

There is one difference to note between the participle examples in (1) and grammatical aspect stimuli in (4). This is that the sentences in (4) include a past tense, while the stimuli in (1), being NPs (Noun Phrases), do not include any finite markers. According to Dowty (1979), Klein (1994), among others, the perfective aspect in (4b) entails that the event of drawing a flower is complete; on the other hand, the imperfective aspect in (4a) remains neutral about the completion of the event. Klein represents (4a) and (4b) as in (5a) and (5b) on the time line:

(5) a. The girl was drawing a flower.



b. The girl drew a flower.

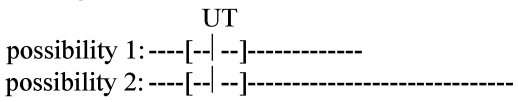


Let us look at the diagrams in (5) closely; ---- represents the situation when the girl was drawing a flower (Klein (1994) calls it *a situation time*), [ ] represents the *Topic Time*, for which the assertion 'the girl was drawing a flower' was made, and | represents the Utterance Time. Klein argues that the progressive aspect places the Topic Time within the situation time as in the two possibilities in (5a). A past tense places the Topic Time in the past with respect to the Utterance Time. Since it is left open whether or not the event of drawing a flower is completed or not, there are two possibilities. In possibility 1, the event of drawing a flower is completed before the Utterance Time. Alternatively, in possibility 2, the girl is still drawing a flower at

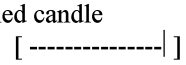
the Utterance Time. Let us now move to the perfective case in (5b). Klein (1994) argues that in (5b), the target state was reached within the Topic Time. This explains why the use of the past tense entails that the event has been completed.

As discussed above, the stimuli used in the experiments reported in the paper are tenseless; hence, the Topic Time is always placed at the same time as the Utterance Time. (1a) and (1b) are represented as in (6a) and (6b) on the time line:

(6) a. burning candle



b. burned candle



"A burning candle' in (6a) has the same interpretation as in (4a) in the sense that there is no entailment whether or not the event gets completed at the later stage. However, this later stage is irrelevant at the time of Utterance in (6a) because the event must be ongoing at the Utterance Time. This distinguishes (6a) from (5a). In (5a), it mattered whether or not the event is completed before the Utterance Time. Possibility 1 in (5a) included a completed interpretation whereas Possibility 2 included an ongoing interpretation. On the other hand, in (6a), both Possibilities 1 and 2 include an ongoing interpretation. This is because there is no past tense included in (6a) that places the Topic Time in the past with respect to the Utterance Time. Finally, (6b) is quite simple as it was the case in (5b). 'A burned candle' entails that the target state of 'burning' has been reached before the Utterance Time.

The first experiment reported here investigates whether or not young Dutch children succeed in matching (6a) to a picture depicting an ongoing event and matching (6b) to a picture depicting a completed event. The second experiment employed the grammaticality judgment task using three pictures. Picture 1 depicted the scene where a ship is starting to sink. Picture 2 depicted the scene where the ship is half-sunken. Finally, Picture 3 depicted the scene where the ship has sunk to the bottom of the ocean. The children were asked to judge whether a statement made by a moon-fish puppet such as "here is a sinking ship" is a grammatical description for each of the pictures. Adults accept 'a sinking ship' as a correct description of both Pictures 1 and 2 and 'a sunken ship' as correct for Picture 3.

2. Experiment 1: Methods

2.1 Subjects

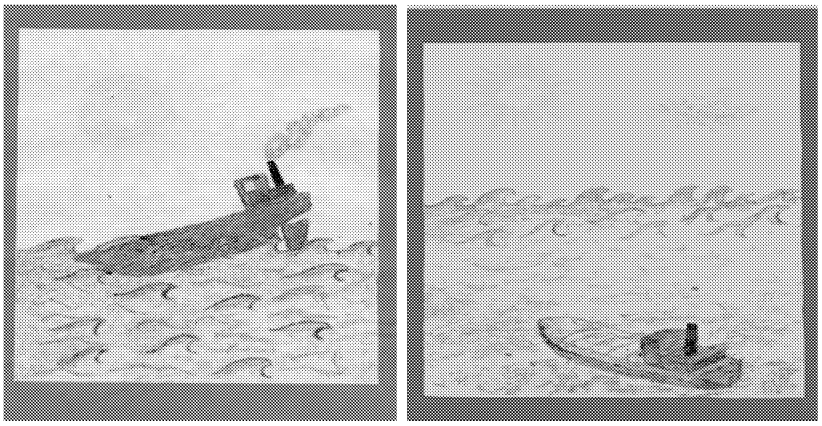
25 Dutch monolingual children between 2;0 and 5;11 plus six adults participated in the experiment. The experiment was carried out at Nijmegen area elementary schools in June 2002. The subjects were divided into four age groups.

2.2 Stimuli

There were two sessions: each session included seven different events. These events were all described using telic predicates (the Dutch forms *of burn, char, fall,*

run empty, melt, sink and *close*). The participants were shown 2 pictures (completed and incomplete events) and they were asked to choose one picture to answer a question such as 'give me the picture of the burning candle'. This method resembles the one in Wagner (2002) in that no agent cue was given. However, it differs from Wagner's in not being a forced choice task. The example pictures for 'zinken' "sink" are shown in (7). (7a) depicts an incomplete and (7b) depicts a completed scene:

(7)



The second session was run 2 weeks later. This session included the same 7 verbs as in the first session; however, the participants were asked to 'give me the picture of the burned candle', using a perfective participle, if they were asked about a present participle in session one (see (8)). Half of the participants did session 1 first and the other half did session 2 first. The test sentences were randomly ordered.

(8) stimuli used in 2 sessions in Experiment 1

session	verbs in English	verbs in Dutch	present/perfective participle?
1	burn	*brandende*	present
1	fall	*gevallen*	perfective
1	run empty	*leeglopende*	present
1	melt	*smeltende*	present
1	char	*aanbrandende*	present
1	sink	*gezonken*	perfective
1	close	*gesloten*	perfective
2	burn	*gebrande*	perfective
2	fall	*vallende*	present
2	run empty	*leeggelopen*	perfective
2	melt	*gesmolten*	perfective
2	char	*aangebrande*	perfective
2	sink	*zinkende*	present
2	close	*sluitende*	present

As discussed above, all the test sentences were tenseless in contrast to Weist, Sysocka and Lyytinen's (1991) and Wagner (2002).

2.3 Procedure

Each session consisted of 7 test and 4 control sentences. For children, 2 experimenters were involved; one experimenter showed them 2 pictures at a time and asked them to choose the right picture. The exact command was in (9):

(9) Wil je mij het plaatje geven met de brandende kaars?
Will you me the picture give with the burning candle
"Will you give me the picture with the burning candle?"

The second experimenter wrote down responses. Each session lasted 15 minutes; all the sessions were videotaped for later analysis. Adult participants were given a questionnaire with the same pictures as the child experiment. 3 adults were given sentences used in Session 1 and the other 3 were given sentences from Session 2.

2.3 Results

The overall results from 5 groups are shown in Figure 1. There was no verb that caused problems. As shown in Figure 1, 2-year-olds performed at chance in both perfective and imperfective (ongoing) trials, although the imperfective trial was slightly better. The performance by 3-year-olds improved in the imperfective trial but remained at a chance level in the perfective trial.

In the perfective trial, a sharp improvement in children's performance is observed between ages 3 and 4. Notice that this improvement was found between ages 4 and 5 in Wagner's (2002) results (reproduced in Fig. 2 below). After the improvement in the perfective trial, the performance in both perfective and imperfective trials stayed parallel and it gradually improved together across age groups. A paired-*t* test showed that there was no difference in the responses given to perfective and imperfective trials within each age group.

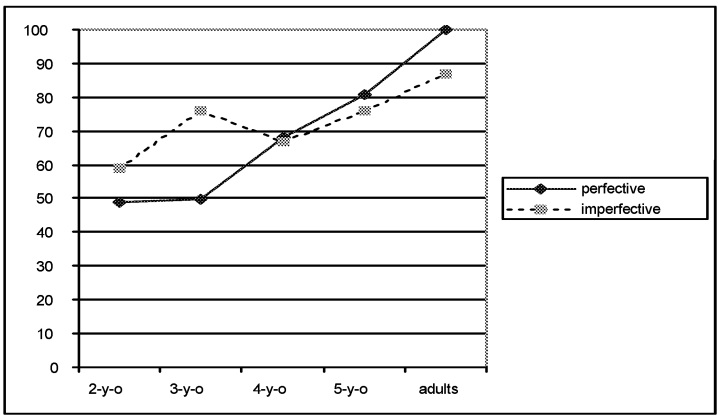


Fig. 1: % correct in Experiment 1 for 5 subject groups

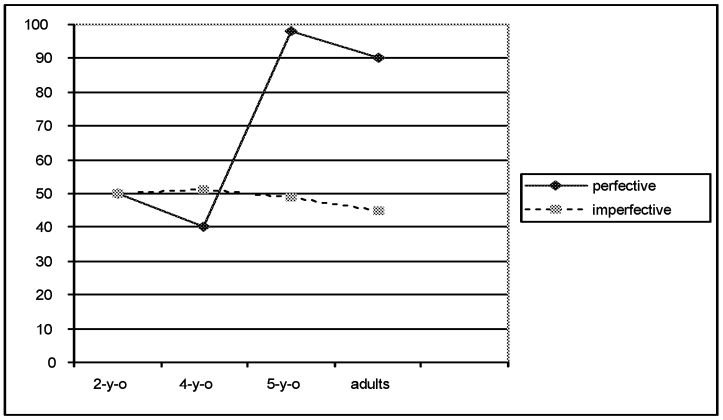


Fig. 2: % correct in Wagner (2002) for 4 subject groups[1]

A mixed design ANOVA was run with age group (2, 3, 4 and 5-year-olds) as a between subject factor and aspect (imperfective vs. perfective) as a within subject factor; there was a main effect of age ($F(3, 20)=4.812$, $p<0.01$) but no effect of aspectual types nor an interaction of age and aspectual types. Post-hoc comparisons were run to see which age groups were involved in the main effect of age. There was a significant difference between 2 and 5-year-olds ($F(1, 20)=11.291$, $p<0.003$); the difference between 2 and 4-year-olds failed to reach significance: ($F(1, 20)=3.317$, $p=0.08$). The difference between 2 and 3-year-olds on one hand and 4 and 5-year-olds on the other was also significant: ($F(1, 20)=6.199$, $p<0.03$). 3-year-olds were significantly difference from 2-year-olds ($F(1, 20)=6.269$, $p<0.02$) but they were not different from 4-year-olds.

2.4 Discussion

The results of this experiment, then, are consistent with Wagner's (2002) results and run contrary to those of Weist, Sysocka and Lyytinen's (1991). It seems as if younger children do not control the perfective/imperfective distinction (in the absence of cues about the agents' intentions). Using a different construction, namely present and perfective participles, and another language, namely, Dutch, again shows a gradual development in children's distinction of aspects.

The results diverged from those in Wagner's (2002), however, in two respects. First, Dutch 4-year-olds performed better in the imperfective-perfective distinction involving participles. Wagner (2002) claims that children do not understand the entailments induced by the imperfective-perfective distinction until age 5. In this experiment, Dutch children start performing like adults in the aspectual distinction at age 4.

Second, the imperfective trials in Wagner (2002) had a lower mean of correct responses, resulting in significant difference between perfective and imperfective trials by 5-year-olds (2002:118). This was due to the fact that the imperfective test sentences in Wagner lacked the completion entailment. Wagner (2002) notes "five-

[1] These figures are estimates based on Figure 1 on page 118 in Wagner (2002).

year-olds remain agnostic about where to match the imperfective sentence (in accordance with the imperfective lack of entailments)" (2002:120). As discussed in the Introduction, this entailment was irrelevant in the stimuli in the paper and there was only one answer for the imperfective trial: an incomplete event. Possibly, for this reason young children performed well in the imperfective trials from early on (age 3). Related to this point, it is worth noting that young children (2 and 3-year-olds) performed better in the imperfective trial than the perfective trial in both Wagner's and this study. This contrast (imperfective better than perfective) then diminishes as children show an improvement in the perfective trial, and eventually, the crossover emerges slightly earlier in the Dutch study of participles (around age 4) than the English study using grammatical aspect (between ages 4 and 5).

The second experiment tested something that Weist, Sysocka and Lyytinen's (1991) and Wagner (2002) were not concerned with; namely, how children behave when the events are depicted in three different stages, instead of two.

3. Experiment 2: Methods

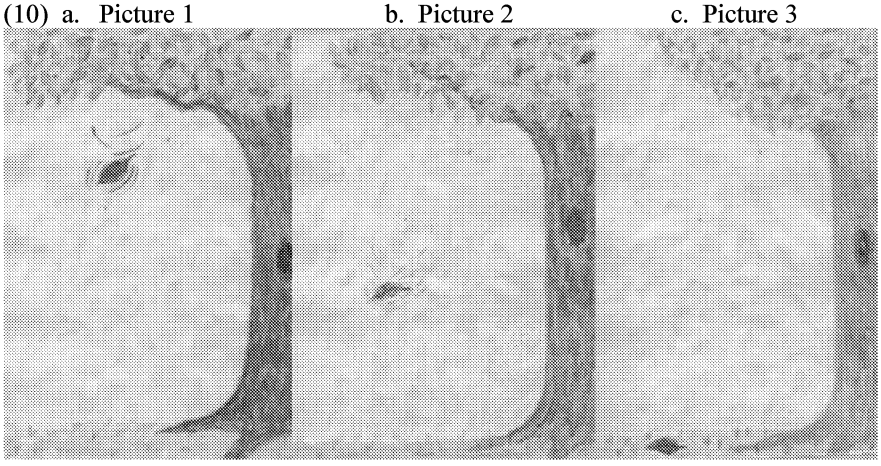
3.1 Subjects

64 Dutch monolingual children between 4;4 and 9;11 plus 7 adults participated in the experiment. The experiment was carried out at Nijmegen-area elementary schools in June 2003. Adult participants were tested at the Max Planck Institute and they were all native speakers of Dutch. There were no overlaps with the subjects who took part in Experiment 1.

3.2 Stimuli

The same 7 events as in Experiment 1 with telic predicates were used but with three pictures. One picture was added to show the 'in-between' event; the complete set of the pictures were now as in (10) (for *vallen* "fall"):

(10) a. Picture 1 b. Picture 2 c. Picture 3



(10a) represents the event that just started, (10b) depicts the event halfway between the beginning and its completion; finally, the completed event is shown in (10c). A

picture choice task used in Experiment 1 only detects the preference of the participants; in other words, it is rare for children to choose two pictures even when there are two pictures that match the description. To address this problem, the grammaticality judgment task (de Villiers and de Villiers (1974), McDaniel and Cairns (1990), and Hiramatsu and Lillo-Martin (1998)) was used, and separate questions were asked for each picture. There were 21 test sentences in each version (plus two warm-up sentences in the beginning). No subjects received both present and perfective participles for the same picture. All the test sentences were given in random order.

3.3 Procedure

For the experiment with child participants, there were two experimenters involved. The first experimenter wore a hand puppet and had a role of a moon-fish called Lulu. At the beginning of the experiment, we explained to the children that Lulu comes from the moon and she is learning Dutch. Since she is very young, she needs help from the children. The children were asked to give Lulu some stickers if she named the pictures in correct Dutch but asked to give Lulu some watermelon if she made mistakes. The children were told that watermelon makes Lulu smarter. After some warm up sentences (usually one grammatical and one ungrammatical), the second experimenter laid three pictures on a table in front of a subject. Lulu pointed at each picture and said something like the utterances in (11):

(11) a. Wat een grote boot! Het is een gezonken boot.
what a big boat this is a sunken boat
"What a big boat! This is a sunken boat."

b. Oh, hier is een zinkende boot.
oh, here is a sinking boat
"Oh, here is a sinking boat."

c. En, dit is een gezonken boot.
and, this is a sunken boat
"And this is a sunken boat."

We encouraged children to evaluate Lulu's Dutch; the ideal child participant should give Lulu a sticker in (11b) and (11c) but a watermelon in (11a). The experiment took between 25 and 30 minutes and all sessions were videotaped for further use. For adult participants, we employed a pen-and-paper grammaticality judgment task. We showed the participants the same pictures that were used in the child experiment and asked them to mark whether each description was grammatical or ungrammatical. We collected data from one adult subject for each of the 7 versions.

3.4 Results

The overall results from six different groups are shown in Fig. 3. All verbs in all versions produced similar results. Fig. 3 shows that the performance by children was not as good as in Experiment 1; this is not surprising given the added complication of an extra scene. In addition, the grammaticality judgment task is

more difficult than a picture choice task. Many children over accept Lulu's utterances as grammatical.

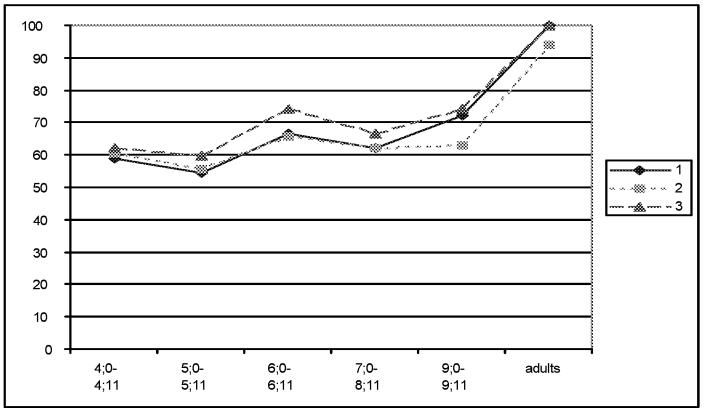


Fig. 3: percentage of correct responses for 3 stages in Experiment 2

As was seen in Experiment 1, 4 and 5-year-olds performed better in the perfective trial (picture 3) than the imperfective trials (pictures 1 and 2). In fact, for all 5 age groups, picture 3 was the easiest picture. We also observed a gradual improvement in both incomplete and completed scenes in pictures 1 and 3. However, picture 2 continued to be difficult even for 9-year-olds, where performance remains just above chance (63%). The following two figures in (Fig. 4 and 5) compare the % correct responses when the expected answers were 'correct' vs. 'wrong'.

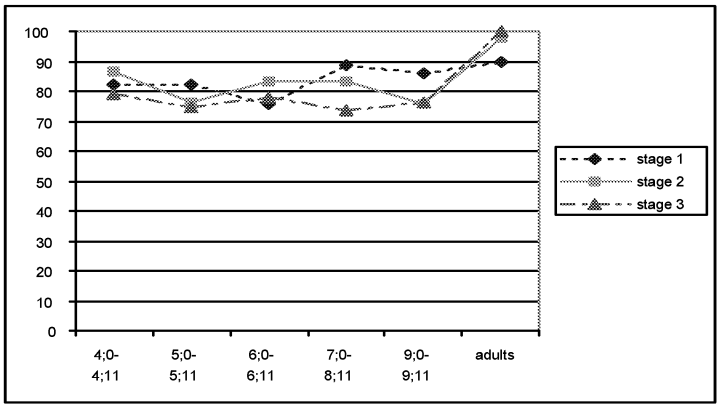


Fig. 4: % correct when the expected answer is 'correct'

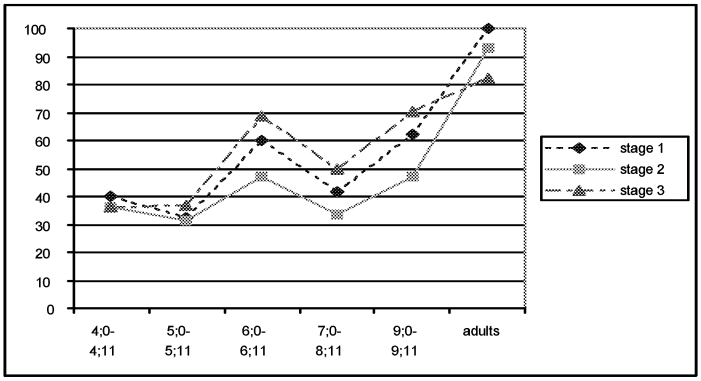


Fig. 5: mean correct when the expected answer is 'wrong'

Fig. 4 shows that even within the youngest group, children's performance is near ceiling in accepting a grammatical description. Fig. 5 confirms the traditional belief that it is difficult for children to evaluate ungrammatical expressions as ungrammatical; in other words, rejection is harder than acceptance. We observed some development across age groups; however, stage 2 remained to be the most difficult. Figure 5 narrows down children's difficulty in Experiment 2 as rejecting a description with a perfective participle such as 'a fallen leaf' as a grammatical description for a stage 2 picture. Combining Figures 4 and 5, what is found in this experiment is that young children consider that both 'a falling leaf' and 'a fallen leaf' to be grammatical for stage 2 pictures.

A mixed design ANOVA with age group (4, 5, 6, 7 and 8-year-olds) as a between subject factor, and aspect type (perfective and imperfective) and picture (stage 1, 2 and 3) as within subject variables with percentage correct as the dependent variable revealed a main effect of age ($F(4,59)=3.474$, $p<0.01$) along with a main effect of aspect type ($F(1,59)=25.382$, $p=0.0001$) and picture ($F(2,59)=3.265$, $p=0.04$). Post-hoc comparisons were carried out to find out exactly which pictures and which age group were responsible for the significant differences in the percentage of correct answers. As for pictures, it was clear that there was no difference in terms of the percentage of correct answers between pictures 1 and 3, or between pictures 2 and 3. There was a significant difference between pictures 1 and 2 ($F(1,59)=5.145$, $p=0.02$). The post-hoc comparison also shows that there is no difference between pictures 1 and 2 in terms of correct acceptance but there was a marginal difference in terms of correct rejection ($F(1,59)=3.033$, $p=0.08$). This again confirms that children's difficulty in Experiment 2 lies in correctly rejecting perfective participles as a grammatical description for Picture 2. As for ages, the post-hoc comparison revealed that 5 age-groups are significantly different from adult controls ($F(1,59)=41.598$, $p<0.0001$). Among children's age groups, 4-year-olds are significantly different from 9-year-olds ($F(1,59)=4.758$, $p<0.03$), and so were 5-year-olds ($F(1,59)=10.45$, $p=0.002$). Apart from these, there were no significant differences between other age groups. From these results, it is clear that significant development occurs between the ages of 7 and 9.

4. Discussion

From this experiment, it is apparent that although 4 and 5-year-olds may have performed well in Experiment 1, this does not mean that they have an adult-like understanding of ongoing vs. completed events as far as participles are concerned. Children are more successful in rejecting a perfective participle with Picture 1 than with Picture 2. Together with the results from Experiment 1, it is shown that the children older than 4 are slightly better at perfective than the imperfective trials.

There is no principled explanation for why the Dutch children had difficulty with Picture 2. According to Bresnan (2000) and Klein (2002), past participles should only occur with activities where a goal is supplied; in 'a half-sunken ship', the perfective participle is possible because a result state is defined by 'half'. In the absence of 'half', however, we cannot use a perfective participle to describe Picture 2. Children might have a problem with what Ackerman and Goldberg (1996) term "a general paradigmatic condition of informativeness" in (12):

(12) Paradigmatic informativeness (27; 1996)
An attributive perfective participle is not felicitous if it is based on a superordinate verb which contrasts with semantically more specific predicates.

According to Ackerman and Goldberg (1996), 'a run child' in (13b) is not a possible expression; however, when you supply 'away' as in 'a run-away child' as a goal phrase, the grammaticality of the expression changes; see (14b). By adding a goal phrase, a perfective participle becomes possible because the predicate becomes semantically more specific. I propose that younger children freely supply a missing goal activity such as 'half', resulting in the incorrect acceptance of 'a sunken ship' as a grammatical description for Picture 2. This proposal also predicts that children should accept both (13) and (14) although adults prefer (14) to (13):

(13) a. # a paid physician b. # a run child c. #fed child

(14) a. an unpaid physician b. a run-away child c. well-fed child

Ackerman and Goldberg's (1996) account of the contrast between (13) and (14) is based on the property that is implied by the head noun. For example, we expect doctors to be paid, and children to be running and fed. However, an attributive perfective participle must represent a property that is not implied by a head noun; thus, the expressions in (13) remain anomalous. Adding an adverb, suffix or a particle changes a property of a predicate into something that cannot be easily inferred; hence, this saves the expressions in (14). It is conceivable that children have difficulty in imagining what kind of properties are implied by a noun due to their limited years of exposure to the world. Children might accept the expressions in (13) as grammatical because they do not expect doctors to be paid or houses to be built. This goes with other experiments that found children's problems with pragmatics (Chien and Wexler 1987) and implicature (Papafragou and Mosolino 2003 among others). It is surprising, however, this difficulty should last as long as 9 years. More detailed study with different stages of incomplete events is necessary to

investigate whether this difficulty is real; whether the same difficulty can be found with grammatical aspect; and how the children come to have an adult-like interpretation of present and perfective participles.

5. Conclusion

The experiments reported here support prior results in Wagner (2002) which indicate children younger than 4 have problems in the interpretation of grammatical aspect morphology. Past research suggested that this problem lay in the absence of agency information. In Experiment 1, we showed that children faced the same difficulty in the perfective-imperfective distinction with present and perfective participles. The results from Experiment 2 revealed that although the children older than 4 seemed to have overcome the problem in the aspectual distinction in Experiment 1, their interpretation of participles was not quite adult-like when we modified the experiment by adding an intermediate stage.

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Wide-scope Indefinites in English Child Language[1]

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1. Introduction

There have been various systematic attempts to account for the well-known linguistic ability of indefinites to allow more than one interpretation, at least since the work by Fodor & Sag (1982). In (1) and (2), for example, the indefinite and numeral can be interpreted outside the scope of the negation (wide-scope) or within the scope of negation (narrow-scope), as shown in (a) and (b) respectively.

(1) Ben didn't kiss a girl
   a. There was a girl that Ben didn't kiss (a > neg)
   b. Ben didn't kiss any girls (neg > a)

(2) The detective didn't find two guys
   a. There were two guys that the detective didn't find (a > neg)
   b. The detective didn't find two guys (i.e. he found only one) (neg > a)

Both (1) and (2) are ambiguous in that they both allow a wide-scope and narrow-scope reading of the indefinites. The wide-scope interpretation is sometimes called 'specific' and the narrow-scope interpretation is called 'non-specific'. The explanations for the behavior of indefinites is still under debate and range from syntactic accounts (movement of the indefinite to escape negation) to purely semantic and/or pragmatic accounts.

More recently, several studies have focused on the ability of children to interpret indefinites in negative sentences. These studies have asked whether children can access the wide-scope interpretation of indefinites when they occur under negation, as in (1) and (2) above. Several studies have reported significant differences between child and adult interpretations (Kramer, 2000; Su, 2001; Lidz & Musolino, 2002), while other studies have found children and adults patterning together (Su, 2001; Miller and Schmitt, 2003). This paper presents three experiments that examine both child and adult abilities to access wide-scope readings of indefinites and provides an alternative account for some of the findings of previous studies. We argue that some of the results are to be associated to children's inability

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to identify sets in the experimental stories and use these sets to interpret the indefinite objects specifically.

This paper is divided as follows: in section 2 we review the acquisition literature and point out a commonality among all of the experiments discussed, namely the fact that they all are trying to access covert partitive readings of the indefinite objects. Section 3 presents an experiment with adults showing that the type of object used in target sentences may influence whether adults are able to access the partitive reading. Based on the findings of this experiment, section 3 presents two experiments on the acquisition of indefinites by children.

2. Acquisition of the Scopal Properties of Indefinites

There are several studies on child and adult interpretation of indefinite objects in negated sentences. Kramer (2000) examined the interaction of indefinites and negation in Dutch, where indefinites have a wide-scope reading when they are scrambled (occur higher than negation) and a narrow-scope reading when they are unscrambled. She tested children ages 4 to 7 and found that Dutch children treated both the unscrambled and scrambled indefinites identically, assigning them both a narrow-scope interpretation.

Su (2001, 2003) examined child interpretation of indefinites and numerals under negation in English- and Chinese-speaking children ages 3 to 6 and found that Chinese children pattern with adults on their interpretation of indefinites while English-speaking children, behaving significantly different from adults, prefer a narrow-scope reading of the indefinite. Both English- and Chinese-speaking adults access the wide-scope reading about 50% of the time.

Lidz and Musolino (2002) tested 3-4 year old English- and Kannada-speaking children on their interpretation of ambiguous sentences involving numerals under negation and found that while adults readily access either scope interpretation for the numeral, children from both language groups preferred the narrow-scope reading of the numeral.

Miller and Schmitt (2003) tested Spanish-speaking children ages 4 to 5 on their interpretation of indefinites and bare singulars under negation and found that, just like Spanish-speaking adults, Spanish children distinguish between bare singulars (obligatory narrow-scope) and singular indefinites (ambiguous).

Two proposals that have been put forth to account for previous findings on child interpretation of indefinites are the Non-Integration Hypothesis (Kramer, 2000) and the Isomorphism account (Musolino, 1998). The Non-Integration Hypothesis proposes that children acquire the predicative interpretation of indefinites early and the specific interpretation later (after age 7). The specific interpretation is acquired later because it requires discourse integration and children are unable to integrate discourse at this age. The Isomorphism account proposes that children depend strongly on syntactic scope when assigning meaning to sentences involving scope interactions. When there is a mismatch between syntactic and semantic scope, child interpretations correlate with the interpretations determined by syntactic scope. Although the Isomorphism proposal is able to account for the results found in a series of experiments on quantification across languages, it cannot account for Kramer's (2000), Su's (2001; 2003) and Miller and Schmitt's (2003) results where

Dutch, Chinese and Spanish children appear to prefer readings that do not correspond to the surface structure.

The Non-integration Hypothesis can account for the above studies as well as Kramer's findings for Dutch children. In all of these studies, children prefer the narrow-scope reading of indefinites under negation. However, it is not clear whether the Non-integration Hypothesis can account for Su (2001, 2003) and Miller and Schmitt (2003) where results showed that Chinese and Spanish children patterned with adults on their interpretation of wide-scope indefinites. The idea that children are unable to form discourse connections has recently been challenged by Wijnen et al. (2003), where they showed that 4-5 year old English-speaking children were able to integrate prior discourse in order to interpret ellipsis. Although Kramer's hypothesis may be ultimately right, it is unclear why children have difficulty integrating discourse to interpret specific indefinites but have no problems in other contexts. The following experiments take a closer look at the components involved in the interpretation of indefinites and aims to explain why discourse integration breaks down for children when confronted with specific indefinites.

One characteristic common to all the above experiments is that the specific reading always involved partitivity. Under the wide-scope interpretation, sentences like *Mickey Mouse didn't ride a dog* and *The detective didn't find two guys* in the contexts provided meant "Mickey Mouse didn't ride one of the dogs" and "The detective didn't find two of the guys". Enç (1991) notes that indefinites become specific when linked to discourse; one way of linking a variable to prior discourse is through a subset relation (a relation of inclusion), as in partitive constructions. Geurts (2002) argues that indefinites always denote properties and if an indefinite occurs as an argument it may be construed as specific or non-specific depending on whether it is backgrounded or not. Backgrounding with respect to partitives is shown in (3).

(3) Partitives and Backgrounding (taken from Geurts, 2002)
-given an expression of the form 'det α of β'
-β's job is to help identify the intended α
-hence β is backgrounded

Hence, indefinites that occur in partitive constructions are backgrounded and indefinites that are backgrounded are interpreted specifically. Applying Geurt's backgrounding proposal to the examples in (4), we show α and β for both an overt partitive and covert partitive, respectively.

(4) a. Mary didn't eat a slice of her pizza
α = a slice
β = her pizza

b. Mary didn't kiss a boy
α = a boy
β = a certain set of boys

In the overt partitive (4a) α = *a slice* and β = *her pizza.* β (*her pizza*) is backgrounded allowing α (*a slice*) to be interpreted specifically. In the covert partitive in (4b) α = *a boy* and β = *a set of boys* that was mentioned previously in the discourse. If this set of boys is apparent to the person listening to the sentence then this set is backgrounded and used to interpret *a boy* specifically. In other words, the

sentence *Mary didn't kiss a boy* would mean "Mary didn't kiss one of the boys"; it has a partitive reading.

Because previous experiments all deal with covert partitives and β is not overtly mentioned in the target sentences, we hypothesized that children may have difficulty recognizing β and hence backgrounding it. We call this the *Backgrounding Hypothesis*. What this means is that, whereas the experimenter and adult subjects may form a set out of the three or four objects being affected in the experimental stories, children are unable to or at least have difficulty doing this. If they do not form a set out of the objects in the experimental stories (i.e. the four guys the detective is searching for, the four dogs being ridden by Mickey Mouse) they cannot background this set and use it to interpret the indefinite or numeral specifically (i.e. assign it a partitive reading). The Backgrounding Hypothesis is stated in (5).

(5) Backgrounding Hypothesis: Children have difficulty backgrounding β in covert partitives because β is not overtly expressed. If β is not backgrounded then α cannot be interpreted specifically.

The present study asks whether making the sets more natural (providing an entity that connects all the members of the set together) will help children background the relevant set against which they can subsequently interpret the indefinite specifically. In other words, would indefinite objects in sentences like *John didn't blow out a candle* where the set of candles becomes obvious because they are all located on one entity (a birthday cake) make it easier for children to background β (the set of candles on the birthday cake) and hence interpret α (a candle) specifically? The goal of the following experiments is to test whether English-speaking children will allow the wide-scope reading of indefinites under negation when presented with indefinite objects that form natural sets. Before running any tests with children, it is essential that we first look at wide-scope indefinites in the adult behavior.

3. Experiments

3.1 Experiment 1: Variability in Adult Judgments

The ability of indefinites to take wide-scope depends a lot on the context in which they occur and the indefinite objects involved. Consider sentences (6), (7), and (8) for example.

(6) Mary didn't eat a hamburger

(7) Mary didn't eat a french fry

(8) Mary didn't eat a piece (i.e. of her cookie)

Although all three sentences are ambiguous, sentence (6) seems to favor a narrow-scope reading of the indefinite while sentences (7) and (8) favor a wide-scope reading of the indefinite. This simply is due to the nature of the entities that the indefinite objects represent; we usually only eat one hamburger but lots of french

fries or pieces (i.e. of a cookie) at one meal. For this reason, we are more likely to assume that there is a pre-established set of french fries or pieces (i.e. of cookie) and use that set to assign a partitive (wide-scope) reading to (7) and (8).

The first study we will discuss examined whether and to what extent adults vary on their interpretation of indefinite objects under negation. This experiment tested adults on experimental stories previously used in a study presented in Su (2001). We chose to replicate this particular study because it is the only one that we are aware of that has focused specifically on English singular indefinites under negation and also because adult subjects in this study performed at chance level (accepting the wide-scope reading of indefinites 50% of the time).

Participants and Procedure. Twenty-nine undergraduates from Michigan State University participated in the study. The task was a truth value judgment task (Crain and Thornton, 1998). Stories were presented with pictures and after each story participants were asked to read a sentence and decide whether it adequately described the story or not. Story scenarios were identical to those used in Su (2001). These stories provided a neutral context; both a wide-scope and narrow-scope reading of the target sentence was plausible. There were four target stories that were randomly mixed in between 70 fillers[2]. All four target stories followed the same scenario and involved a main character (i.e. girl named Angie) who was thinking about doing something (i.e. riding animals). At first the main character didn't want to do anything to the first type of objects (i.e. dogs) she encountered. The possible outcome was thus considered at some point in the story and so the condition of plausible dissent was satisfied. Although the main character preferred the other type of objects (i.e. horses), for some reason (i.e. the horses were wild and kept jumping) the character couldn't do what she wanted to. Therefore, the character went back to the first type of objects and did the action on two of the three objects (because one of them was not qualified).

Results. Table 1 shows the four target sentences along with the percentage of wide-scope interpretations accessed for each sentence. Note that for all studies discussed in this paper, an answer of TRUE equals a wide-scope reading and an answer of FALSE equals a narrow-scope reading.

	Target Sentence	**Adults**
1.	Angie didn't ride a dog	65.5% (19/29)
2.	Denny didn't eat a cookie	86.2% (25/29)
3.	Troy didn't buy a hat	34.5% (10/29)
4.	Julie didn't feed a cat	75.9% (22/29)
	Total	**65.5% (76/116)**

Table 1. Experiment 1: Adult wide-scope readings

Looking at the total percentage of wide-scope readings for all participants on all sentences combined reveals that, similar to what was reported in Su (2001), adults perform at about chance level (65.5%), which at first glance seems to imply that

[2] Because adults are better than children at figuring out exactly what experimental tasks are measuring, studies of this sort that involve various fillers are essential for discovering exactly how adult participants actually interpret the sentences under investigation.

adults in general treat all of these sentences as ambiguous. However, the percentage of wide-scope readings for each individual sentence shows that this is not the case. The acceptance of wide-scope readings for indefinites varies considerably from sentence to sentence, with indefinites in sentences such as *Denny didn't eat a cookie* getting a wide-scope reading 86% of the time and indefinites in sentences such as *Troy didn't buy a hat* getting a wide-scope reading only 34% of the time. Out of the four sentences tested, only sentence (2) in Table 1 had an indefinite wide-scope reading over 80% of the time, and wide-scope readings of indefinites were significantly higher than chance (chance being equal to 50%) only in sentences (2) and (4). The findings from Experiment 1 confirm the variability that does indeed exist in adult judgments of wide-scope indefinites depending on the objects chosen.

3.2 Experiment 2a: Partitivity in Child Language

In order to verify whether children allow specific readings of indefinites under negation we modified our target stories in two ways: (i) the indefinite objects involved belonged to pre-specified sets that were connected together by a larger object (eggs in a basket, letters on a chalkboard) (to make backgrounding of β easier for children); (ii) the protagonist in the story was required to carryout an action on all of the objects in that set before beginning another activity (Wason's "Contexts of Plausible Denial", 1965) with only one item out of four being left unaffected (Wason's "Exceptionality Hypothesis", 1965)[3].

Before working with children we tested adult subjects on twelve different target sentences involving indefinite objects of this type in order to verify that adults actually prefer the wide-scope reading of these indefinites. These 12 sentences were mixed in between 70 fillers. Of these twelve target sentences, we chose the four target sentences in Table 3 to use in our study. For all four sentences the wide-scope reading of the indefinite object was preferred at least 83% of the time by adults.

Participants. Twenty children aged 3;10 – 5;8 (mean 4;7) from daycare centers and kindergartens in Lansing, Michigan were recruited for the study. Additionally, ten undergraduate students from Michigan State University were recruited as controls.

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[3] All previous studies discussed in this paper as well as the present experiments deal with the interpretation of negated sentences. Studies have shown that processing of negation is harder for both children and adult subjects (see Horn, 1989 for a review of studies dealing with the acquisition and processing of negation). Horn cites Wason (1961) as showing that adults subjects are much faster and more accurate at verifying *false* negatives than at verifying *true* negatives. Given this finding, we should expect children to have a "false" bias instead of a "true" bias on the studies discussed in the present paper.

To make sure experimental sentences were felicitous, we incorporated Wason's (1965) (cited in Horn, 1989) Exceptionality Hypothesis which proposes that negation is most natural when it is associated with a dissimilar item set off against the rest of a class of similar items (the ground). We also incorporated Wason's (1965) (cited in Horn, 1989) Contexts of Plausible Denial, which says that the function of negative sentences is generally to emphasize that a fact is contrary to an expectation (Cornish and Wason, 1970) (cited in Horn, 1989).

Procedure. A truth value judgment task was used. Note that although the target stories favored a partitive reading, a narrow-scope interpretation is also felicitous and hence is not incorrect. All children were tested individually in a quiet room. We used computer picture slides to present experimental stories to children. All experimental sentences were pre-recorded by a person who was unaware of the experimental objectives. After each experimental story, a computer-animated puppet appeared on the screen and read the pre-recorded experimental sentence to the child. Children were instructed to feed the monster grapes, if he guessed right, and bananas, if he guessed wrong by clicking on the grape or banana icon. The computer-animated monster would then eat the fruit the child chose. All children were given a pretest to make sure they could use the computer mouse and they understood the task. We found that children did extremely well and most children also provided their answers orally in addition to using the mouse. Adult participants were tested in groups and experimental stories were presented with the same computer images. Adult subjects read experimental sentences after each story and were asked to decide whether the sentence accurately described the story or not. A sample target story is shown in Table 2. All target stories followed the same format. There were four target sentences mixed in randomly between 19 fillers and controls.

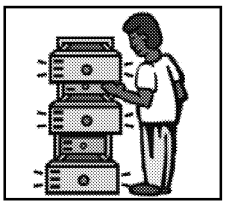
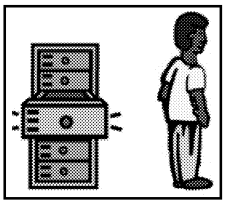
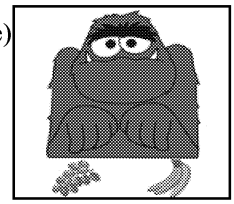
Researcher:	"This is Peter and these are drawers that are all in his dresser and he's closing them. Peter's dad told him to close all of the drawers before going outside to play. Let's see what happens."	
Researcher:	"Look. Now Peter is going outside to play. But wait! What about this one? He didn't close this one. Let's see if the monster can say what happened."	
Monster: "Peter didn't close a drawer." (recorded voice) a. Peter didn't close one of the drawers (a > neg) b. Peter didn't close any drawers (neg > a)		

Table 2. Experiment 2a and 2b: Sample target story

Results. Table 3 shows the four target sentences used in Experiment 2a along with the percentage of wide-scope interpretations for children and adults for each sentence.

	Target Sentence	**Adults**	**Children**
1.	Mary didn't paint an egg	100% (10/10)	90% (18/20)
2.	Susan didn't erase a letter	100% (10/10)	95% (19/20)
3.	Peter didn't close a drawer	100% (10/10)	85% (17/20)
4.	Timothy didn't blow out a candle	100% (10/10)	95% (19/20)
	TOTAL	**100%**	**91%**

Table 3. Experiment 2a: Percentage of wide-scope readings

The results show children and adults patterning together on their interpretation of target sentences. Overall children accept the wide-scope reading of indefinites 91% of the time while adults accept this reading 100% of the time. There was not a significant difference between these scores and children performed significantly higher than chance ($t(19) = 11.000$, $P < 0.05$), chance equals 50%. 75% of all children accessed the wide-scope reading 100% of the time.

Because children did so well on Experiment 2a, we decided to run two follow-up experiments to test whether altering the experimental stories would change children's interpretation. Experiment 2b omits part of the text used in Experiment 2a and Experiment 3 presents experimental stories by acting them out with toys rather than presenting them on computer picture slides.

3.3 Experiment 2b: Partitivity in Child Language Follow-up

This experiment was identical to Experiment 2a except that the sentence *He didn't close this one* was omitted from the experimental story text. We decided to omit this sentence to see whether children would still allow the wide-scope reading of the indefinite even though we never explicitly stated that the character (in this case Peter) didn't carry out the intended action on one of the items in the set (didn't close one of the drawers).

Thirteen English-speaking children aged 4;2 – 5;8 (mean age = 4;9) from daycare centers and kindergartens in Lansing, Michigan and fourteen undergraduate students from Michigan State University were recruited for this experiment.

Results. Table 4 shows the four target sentences used in Experiment 2b along with the percentage of wide-scope interpretations for children and adults for each sentence.

	Target Sentence	**Adults**	**Children**
1.	Mary didn't paint an egg	93% (13/14)	100% (13/13)
2.	Susan didn't erase a letter	93% (13/14)	100% (13/13)
3.	Peter didn't close a drawer	100% (14/14)	85% (11/13)
4.	Timothy didn't blow out a candle	100% (14/14)	85% (11/13)
	TOTAL	**96%**	**92%**

Table 4. Experiment 2b: Percentage of wide-scope readings

The results show children and adults patterning together on their interpretation of target sentences. Overall children accept the wide-scope reading of indefinites 92% of the time while adults accept this reading 96% of the time. There was not a significant difference between these scores and children performed significantly higher than chance ($t(12) = 8.124$, $P < 0.05$), chance equals 50%. 85% of all children accessed the wide-scope reading 100% of the time.

3.4 Experiment 3. Partitivity in Child Language: Stories Acted Out

Almost all of the previous experiments on indefinites under negation tested children by acting out the experimental stories with toys. In order to verify that our results in Experiments 2a and 2b are not merely the result of the materials we used to present the experimental stories, Experiment 3 tests children by acting the stories out with toys.

Participants. Eleven English-speaking children aged 4;7 – 7;5 (mean age = 6;0) were recruited from daycare centers and kindergartens in Lansing, Michigan. Twenty undergraduate students from Michigan State University served as controls.

Procedure. As in previous studies, a truth value judgment task was used. Although the experimental stories favored a partitive reading, a narrow-scope interpretation is also felicitous and hence is not incorrect. All children were tested individually in a quiet room. All experimental stories were acted out with toys and experimental sentences were read by a puppet. Children were instructed to feed the puppet grapes, if he guessed right, and bananas, if he guessed wrong. Adult participants were tested in groups and the experimental stories were presented in a video. Adult subjects read experimental sentences after each story and were asked to decide whether the sentence accurately described the story or not. The experimental target sentences were identical to those used in Experiments 2a and 2b. A sample target story is shown in (9). All target stories followed the same format. The four target sentences were mixed in between 4 controls.

(9) This is Timothy and these are letters that are all written on the chalkboard and he's erasing them. His teacher told him to erase all of the letters before going out to recess. Let's see what happens! (Timothy erases three of the four letters, one-by-one then says, "I'm tired, I'm going out to recess"). But wait he's not finished! Let's see if Petey can say what happened.

Results. Table 5 shows the four target sentences used in Experiment 3 along with the percentage of wide-scope interpretations for children and adults for each sentence.

	Target Sentence	**Adults**	**Children**
1.	Mary didn't paint an egg	85% (17/20)	73% (8/11)
2.	Susan didn't erase a letter	90% (18/20)	73% (8/11)
3.	Peter didn't close a drawer	90% (18/20)	81% (9/11)
4.	Timothy didn't blow out a candle	90% (18/20)	73% (8/11)
	TOTAL	**89%**	**77%**

Table 5. Experiment 3: Percentage of wide-scope readings

The results show children and adults patterning together on their interpretation of target sentences. Overall children accept the wide-scope reading of indefinites 77% of the time while adults accept this reading 89% of the time. There was not a significant difference between these scores and children performed significantly higher than chance $t(10) = 2.292$, $P < 0$ .05, chance = 50%. 64% of all children accessed the wide-scope reading 100% of the time.

It is interesting to note that even though children and adults patterned together on this task, the percentage of wide-scope readings for both groups decreased as a result of acting the tasks out with toys rather than presenting them with computer picture slides. Interestingly, the children in Experiment 3 were also older than those in Experiments 2a and 2b. This decrease in wide-scope readings is most likely due to the fact that the majority of the target story focused on the main character carrying out the activity (i.e. erasing letters) and less time on the left-over object (the one letter that was not erased). Given this fact about the experimental stories in Experiment 3 and the fact that children still preferred the wide-scope reading of the indefinites demonstrates very clearly that this reading of indefinites is available to children early on.

4. Results and Discussion

The experimental studies discussed in this paper provide insight into child and adult interpretation of wide-scope indefinites. Experiment 1 shows that adult judgments on indefinites under negation are not uniform across all sentences; instead, judgments vary according to the type of object used in the sentence. While adults preferred the wide-scope reading over 86% of the time in a sentence like *Denny didn't eat a cookie* they only allowed this reading 34% of the time in a sentence like *Troy didn't buy a hat.* It should not be surprising then if we find children also avoiding wide-scope readings of some indefinite objects.

Based on the results of Experiment 1, Experiments 2a, 2b and 3 retest English-speaking children on their interpretation of wide-scope indefinites by using experimental sentences with indefinite objects that favored a wide-scope (partitive) reading in the adult grammar. In all three studies, we found that children, like adults, overwhelmingly assigned a wide-scope interpretation to the indefinite objects.

The experimental studies discussed in this paper provide strong evidence against the Isomorphism account (Musolino, 1998), which predicts that child interpretation of indefinites under negation should correlate with surface syntactic scope. Our results show clearly that as long as discourse conditions are met, English-speaking children have no difficulty accessing the wide-scope interpretation of indefinites under negation. The fact that our results provide evidence against the Isomorphism account is not surprising since evidence of this sort has been reported in several studies (Kramer, 2000; Su, 2001, 2003; Miller and Schmitt, 2003).

The Non-integration Hypothesis proposes that children acquire the predicative interpretation of indefinites early and that the wide-scope reading of the indefinite is acquired later (at about 7 years of age) because it requires discourse integration. However, as noted earlier, studies are showing that children are sensitive to discourse by this age. If children are sensitive to discourse, why did they have difficulty accessing the wide-scope reading of indefinites in previous studies? What is it about wide-scope indefinites that cause them so much trouble? We believe that the answer to this question has to do with the ability of children to identify and *background* the set against which the indefinite is to be interpreted specifically.

Geurts (2002) points out that indefinites are non-specific by default because they tend to carry new information and that it is only under special circumstances that new information is backgrounded (as in partitive constructions) and in this case the indefinite in question is interpreted specifically. Therefore, even for adults, there should be a preference for accessing the narrow-scope reading of the indefinite. For the experiments presented in this paper as well as for several previous studies on indefinites, the wide-scope reading of the target sentence was partitive. In other words, all target sentences were ambiguous between a non-specific reading (i.e. the detective didn't find two guys, he found only one) and a partitive reading (the detective didn't find two of the guys). This is not to say that all specific indefinites are partitive; instead, it just happens to be the case that the experimental stories in several of these previous studies were set up in a way that favored a partitive reading of the indefinite or numeral. Moreover, since target sentences were covert partitive constructions (β is not overtly mentioned), children had to infer β from the context. For a sentence like, *The detective didn't find two guys*, subjects must background the *set of guys* against which the indefinite *a guy* is interpreted specifically. We believe that in previous studies indefinites were interpreted non-specifically because children did not make a set out of the objects (i.e. the four guys) against which they could subsequently interpret the indefinite or numeral specifically. In other words, as predicted by the Non-integration Hypothesis, children were unable to use prior discourse to interpret the indefinite specifically. The present study helped children identify β by providing a context where the objects were all linked together by a larger entity (i.e. drawers in a dresser, candles on a cake). This allowed children to recognize these objects as forming a set and use this set to interpret the indefinite specifically.

5. Conclusion

This paper has provided two important facts about child and adult interpretation of wide-scope indefinites. First, we have shown that even though the sentences involving indefinites under negation are ambiguous, adult interpretations vary greatly from one sentence to the next, a finding which may explain why children often avoid the wide-scope reading of indefinites as well. Secondly, we have shown that when children can background the relevant set against which to interpret the indefinite, English-speaking children as young as 4 years of age have no trouble accessing the wide-scope reading of indefinites under negation.

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The Limits of Context in L2 Semantic Ambiguity Resolution

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1. Introduction

1.1 Native and non-native sentence processing

A growing body of research in the generative paradigm investigates differences between non-native and native sentence processing. Research has focused on syntactic and lexico-syntactic ambiguity resolution, such as filler-gap dependencies (Juffs and Harrington 1995, 1996; White and Juffs 1998), argument structure (Frenck-Mestre and Pynte 1997; Juffs 1998a, 1998b), garden path problems (Juffs 1998b), relative clause attachment (Papadopoulou and Clahsen 2003) and the resolution of VP-ellipsis versus anaphora (Duffield and Matsuo 2001), among others. Recently, Papadopoulou and Clahsen (2003) argued that second language (L2) learners' processing of relative clause attachment reflects a contextual strategy, whereas native speakers' processing is structurally determined. In this paper, we address the respective role of the structure of interpretations versus contextual knowledge in the resolution of scope ambiguity in native versus non-native processing.

With Fodor (2000), we assume that the degree to which computations are determined by the structure of representations (rather than by the global context) distinguishes the processing of specialized modules versus central systems in mental organization. Papadopoulou and Clahsen's (2003) findings, therefore, opened up the possibility that non-native and native sentence processing differ significantly. However, we argue for a syntactically-driven algorithm in the manner in which English-French learners resolve semantic ambiguity due to quantifier scope in the interpretation of cardinality interrogatives.

1.2 Scope ambiguity in cardinality interrogatives

If Monique, Sylvie and Véronique (as restaurant critics) all evaluated Le Nôtre, La Tour D'argent, and each evaluated a different third restaurant, three answers to (1) are possible: *three*, *two* and the collective answer *five*.

(1) Combien de restaurants est-ce que tous les critiques ont évalués?
How many of restaurants is-it-that all the critics have evaluated
"How many restaurants did all the critics evaluate?"

We refer to the answer *three* as the distributive answer and to the answer *two* as the common answer. The distributive and common interpretations depend on whether *de restaurant* 'of restaurants' takes scope under or over *tous les critiques* 'all the critics' respectively. Thus, *three* corresponds to the maximal cardinality *n* such that for every critic there are some *n* restaurants that she evaluated. This interpretation requires that the existential object take scope under the universal subject quantifier.

Two corresponds to the maximal cardinality of some set of restaurants that every critic evaluated. This latter interpretation requires that the existential object take scope over the universal subject quantifier. The collective answer *five*, in contrast, does not involve scope.

In French, the particle *de* with a Case-theoretic licenses the restriction of the interrogative quantifier in thematic position as in (2) (Obenauer 1984/1985).

(2) Combien est-ce que tous les critiques ont évalué de restaurants?
How many is-it-that all the critics have evaluated of restaurants
"How many restaurants did all the critics evaluate?"

de Swart (1992) argued that in situ arguments take narrow scope. Thus, (2) does not allow common answers, but admits collective and distributive answers. Furthermore, (2) (unlike (1)) is not felicitous in the background provided by (3) because the interpretation of the object in situ does not presuppose that there is a non-empty set of restaurants in the context. It is, therefore, conversationally implied by (2) that there is no such contextual set contrary to what (3) has already established.

(3) Hier, il restait cent restaurants à évaluer, mais plus autant aujourd'hui.
"Yesterday, there were a hundred restaurants to evaluate, but not as many today."

Assuming Diesing's (1992) clausal partition, an indefinite restriction such as *de restaurants* in thematic position inside VP can be interpreted as an inherently restricted individual variable bound by a VP-level existential closure operation at the semantic interface. Then, the existence of restaurants in the context is not presupposed. The indefinite can also be interpreted outside of the VP (either VP-adjoined or IP-adjoined) via Quantifier Raising (QR). Then, existence is presupposed. Scope of the existential restriction under the universal subject (with the restriction either in situ or in a VP-adjoined QR position) determines a distributive interpretation. Scope of the existential restriction over the universal subject (with the restriction in an IP-adjoined QR position) determines a common interpretation.

1.3 Interpretation in English-French development

Dekydtspotter, Sprouse, and Swanson (2001) administered a task in which continuous and discontinuous interrogatives were crossed with distributive and common answers to be accepted or rejected as true answers to the question in the context provided by a scenario. Scenarios included information supporting distributive, common and collective answers. But, distributive answers were matched by a neutral context, whereas common answers were matched with a context that included a presupposition that the common answer was expected. Intermediate learners of French did not exhibit knowledge of the scope constraint on discontinuous cardinality interrogatives as in (2). Intermediate learners accepted distributive and common answers virtually equally irrespective of sentence structure. In contrast, advanced learners developed such knowledge: Advanced learners

accepted distributive answers to discontinuous interrogatives significantly more than common answers, but crucially no such difference appeared with continuous interrogatives. On the basis of a severe poverty of the stimulus problem posed by the acquisition of discontinuous cardinality interrogatives, Dekydtspotter, Sprouse, and Swanson argued that L2 learners' interpretation is governed by Universal Grammar.

Dekydtspotter (2001) noted that those advanced learners who showed knowledge of the constraint on discontinuous interrogatives also exhibited a significantly lower acceptance of common answers than of distributive answers to continuous interrogatives, which is reminiscent of the French natives' pattern on the same task. This asymmetry occurred despite the contextual presuppositions accompanying common answers. In contrast, those advanced learners who did not exhibit knowledge of the constraint on the interpretation of discontinuous sentences accepted common answers more readily, like the English comparison group on a similar task. An asymmetry in the relative salience of scope-dependent interpretations of continuous interrogatives therefore developed with the acquisition of discontinuous interrogatives. This difference between the two types of (advanced) learners mirrored a difference between French native speakers and English native speakers on an instrument eliciting numerical responses to cardinality interrogatives discussed in Villalta (2003).

In summary, those grammars that license *discontinuous* cardinality interrogatives (with their interpretive restrictions) also appear to inhibit acceptance of contextually salient common answers to *continuous* cardinality interrogatives. This pattern suggests a potentially greater role of the context in the response pattern of learners with English-type interlanguage grammars versus learners with French-type interlanguage grammars. What remains to be elucidated, however, are the precise relationships between grammar, processor and context.

1.4 Scope ambiguities and the performance system

We assume *Incremental Comprehension* as organizing principle: *All available information is put to the goal of maximizing the parse—up to the limits of Universal Grammar* (Crocker 1996). In terms of grammar-parser relations, it is feasible that the sentence processor is (largely) universal, constrained by universal principles of economy as conceived in Minimalism. Scope resolution follows the organizing principle Minimal Attachment as in (4) (see Frazier and Clifton (1996) and Gorrell (1995) for formulations of Minimal Attachment in the spirit of Minimalism).

(4) Minimal Attachment: Attach incoming material into the phrase marker being constructed with the fewest nodes consistent with the well-formedness rules of the language (Frazier 1979: 76).

According to the economy-driven parse strategy in (4), the smallest structure that allows an interpretation is built on first pass. If this representation cannot be contextually integrated, then the minimal repair is made to the structure. If this representation can be contextually integrated, no further changes are made. In such a structural model, processor actions are determined by grammatical principles applying incrementally. The least representation that allows for an interpretation is

built on first pass. Context has a licensing role: Contextual integration determines commitment to the analysis; lack of contextual integration forces a revision.

Alternatively, the processor can be organized to take full advantage of contextual information. Assuming Crain and Steedman's (1985) *Parsimony Principle* as central organizing principle, the processor selects analyses with the fewest unsatisfied but consistent presuppositions. The relative contextual fitness of competing interpretations in the Maxims of Conversational Cooperation determines the most plausible interpretation, eliminating those that are not plausible. Contextual information can determine syntactic parse actions by specifying the LF representation that satisfies the Parsimony Principle. Information flows from contextual knowledge to the syntactic processor through the interpretive systems. In such a model, grammar constrains the set of possible representations, but does not force access to representations irrespective of contextual plausibility.

1.5 Minimal attachment, argument licensing and access to interpretations

We now consider in (5) how the structural performance system interacts with the syntax of cardinality interrogatives to determine access to common interpretations. Upon encountering *Combien de restaurants* 'how many restaurants,' a CP node as well as its IP and VP substructures is generated by Incremental Comprehension. The existential restriction *de restaurants* is then integrated into the structure in accordance with Minimal Attachment and language-particular, argument-licensing parameters.

(5) "Combien de restaurants est-ce que tous les critiques…"

CP
∧
DP_j C'
∧
C IP ← IP-level QR
est-ce que ∧
DP_j IP
de restaurants ∧
DP VP
tous les critiques$_i$ ∧
I VP ← VP-level QR
∧
DP_j VP ← Existential (∃) closure operation
de restaurants ∧
DP V'
t_i ∧
V DP_j ← In situ interpretation under ∃ closure
... *de restaurants*

In French, where *de*-marked arguments can be Case-licensed in situ, Minimal Attachment requires that the restriction be interpreted in thematic position on first pass, since this is the smallest structure that allows an interpretation. This integration

determines a distributive non-presuppositional interpretation. If such an interpretation cannot be contextually integrated because a contextual presupposition is not satisfied, then a QR position is required. Again, Minimal Attachment requires that the restriction be interpreted at the VP level on second pass before an eventual IP-level site (if any) is posited. If such a structure is not contextually integrated, because the set of restaurants in common is uniquely relevant, then an IP-level QR position is posited. Thus, we expect that integration of the restriction into the structure requires more processing time for the common interpretation of the cardinality interrogative than for distributive interpretations.

In English, in contrast, a VP-adjoined node is required for Case checking purposes. The interpretation of the restriction is, therefore, forced in the VP-adjoined position, since an interpretation obtains at that level. The IP-level interpretation of the restriction associated with common answers requires fewer revisions from the first pass (VP-external) representation in English than from the first pass (VP-internal) representation in French.

2. A reading time experiment

2.1 Participants

Thirty nine English-French learners were presented with a randomized battery of forty items on a Macintosh computer using the experimental software, PsyScope. They were all native speakers of English, enrolled at Indiana University. The intermediate learner group (n = 23) was comprised of learners in their fourth semester of college French. They would generally be considered intermediate high in an OPI-ACTFL proficiency test (Magnan 1986). The advanced learner group (n = 16) was composed of graduate students in French. They would generally fall in the advanced category in an OPI-ACTFL proficiency test (Magnan 1986). L1 processing data from young adult native English speakers (n = 32) and native French speakers (n = 16) were also collected. The respondents in the English native group were enrolled in second semester French and the respondents in the French native group were graduate students. All respondents therefore originated from monolingual communities and had been exposed to another language in classroom settings.

2.2 The instrument

Twenty experimental test items, which were randomly chosen from a list of forty items of the types below, and twenty filler items were used in the task. Each item included a scenario in the native language of the respondent, a self-paced segment-by-segment presentation of the interrogative (which was in French for French natives and learners and in English for the English comparison group) and a numerical answer in Arabic notation. The respondents pressed a button to accept the answer, reject the answer, or opt out if they could not accept or reject. The scenarios supported the full range of numerical answers (i.e., the collective answer *5*, the distributive answer *3*, and the common answer *2*). The scenario matching the distributive answer was in principle compatible with a range of answers (dependent on the perspective taken by the respondent). In contrast, the scenarios matching the

common answer included a presupposition that the cardinality of the set of objects in common was relevant.

2.3 Examples of test items

Figure 1: Open-ended context with distributive answer

As chief editor of *Gourmet Magazine*, I must make sure that each restaurant is evaluated by some food critic. Last week, Monique evaluated Le Nôtre, La Tour D'argent and Chez Paul. Sylvie evaluated Le Nôtre, La Tour D'argent and Chez Pierre. Véronique evaluated Le Nôtre, La Tour D'argent and Chez Jacques.

Combien/	de restaurants/	est-ce que/	tous les critiques/	ont/	donc/	évalués?/
how many	of restaurants	is it that	all the critics	have	thus	evaluated

3

Figure 2: Context presupposing a common answer with common answer

As chief editor of *Gourmet Magazine*, I am getting concerned that the food critics visit mostly the same restaurants. Last week, Monique evaluated Le Nôtre, La Tour D'argent and Chez Paul. Sylvie evaluated Le Nôtre, La Tour D'argent and Chez Pierre. Véronique evaluated Le Nôtre, La Tour D'argent and Chez Jacques.

Combien/	de restaurants/	est-ce que/	tous les critiques/	ont/	donc/	évalués?/
how many	of restaurants	is it that	all the critics	have	thus	evaluated

2

2.4 Procedure

Correctly accepted answers indicate which scope-dependent representation was accessed. But, when respondents pressed the *no* button, this was not necessarily because they accessed the alternative scope representation. Therefore, reading times from *yes* answers only are analyzed.

3. Results

Comparisons between the intermediate and advanced English-French learner groups (provided in Table 1 for distributive interpretations and in Table 2 for common interpretations) reveal differences for specific segments only. With *yes* responses to distributive answers *only*, intermediates produced significantly longer reading times than advanced learners only for the *de NP*, *est-ce que* and *tous les N* segments. No other difference was significant. With *yes* responses to common

answers, the verb segment showed significantly longer reading times for the advanced learners than for the intermediate learners.[1]

Segments	intermediate 95 cases	advanced 55 cases	t-test statistics	
combien	420.18 ms	373.07 ms	t(148) =1.77,	p = .078
De NP	439.99 ms.	285.24 ms.	t(132.64) = 3.64,	p < .0005
est-ce que	483.48 ms.	304.18 ms.	t(140.27) = 3.62,	p < .0005
tous les N	655.61 ms.	380.09 ms.	t(140.27) = 3.62,	p < .0005
Aux	571.83 ms.	443.55 ms.	t(148) = 1.79,	p = .076
donc	427.57 ms.	483.11 ms.	t(66.27) = .79,	p = .434
Verb	923.57 ms.	1062.91 ms.	t(129.70) = .70,	p = .484

Table 1: Reading times of interrogatives on the *distributive* interpretation: *Intermediate versus advanced learners*

	intermediate 109 cases	advanced 49 cases	t-test statistics	
combien	445.79 ms.	337.31 ms.	t(156) = 1.38,	p = .170
De NP	409.59 ms.	359.41 ms.	t(156) =1.40,	p = .164
est-ce que	429.13 ms.	385.32 ms.	t(156) = 1.32,	p = .190
tous les N	634.91 ms.	558.29 ms.	t(156) = .81,	p = .422
aux	509.20 ms.	471.82 ms.	t(156) = .52,	p = .604
donc	478.80 ms.	613.04 ms.	t(58.51) = 1.42,	p = .160
verb	776.76 ms.	1598.59 ms.	t(53.18) = 2.46,	p = .017

Table 2: Reading times of interrogatives on the *common* interpretation: *Intermediate versus advanced learners*

These asymmetries do not follow from advanced learners' greater familiarity with lexical items, since familiarity with lexical items should affect both interpretations

[1] Since there are two subpopulations of learners, we assume a Bonferonni protection measure of $\alpha = .05/2 = .025$.

equally. Asymmetries also do not appear to follow from enhanced use of contextual clues by advanced learners, since this should favor common interpretations.

Analyses of reading times on distributive versus common interpretations also reveal a developing bias for distributive interpretations.

	common 49 cases	distributive 55 cases	t-test statistics	
combien	377.31 ms.	373.07 ms.	t(102) = .17,	p = .867
de NP	359.41 ms.	285.24 ms.	t(102) = 2.32,	p = .022
est-ce que	385.32 ms.	304.18 ms.	t(102) = 3 .19,	p = .002
tous les N	558.29 ms.	380.09 ms.	t(102) = 2 .42,	p = .017
aux	471.82 ms.	443.55 ms.	t(102) = .48,	p = .631
donc	613.04 ms.	483.11 ms.	t(102) = 1.18,	p = .242
verb	1598.59 ms.	1062.91 ms.	t(67.03) = 1.50,	p = .138

Table 3: Reading times of interrogatives-*Advanced* population (n = 16): Common versus distributive answers

	common 109 cases	distributive 95 cases	t-test statistics	
combien	445.79 ms.	420.18 ms.	t(202) = .67,	p = .503
De NP	409.59 ms.	439.99 ms.	t(147,77) = .70,	p = .485
est-ce que	429.13 ms.	483.48 ms.	t(151,76) = 1.33,	p = .186
tous les N	634.91 ms.	655.61ms.	t(202) = .24,	p = .811
aux	509.20 ms.	571.83 ms.	t(202) = .95,	p = .344
donc	478.80 ms.	427.57 ms.	t(202) = 1.36,	p = .166
verb	776.76 ms.	923.57 ms.	t(202) = .99,	p = .324

Table 4: Reading times of interrogatives-*Intermediate* population (n = 23): Common versus distributive answers *(no differences emerge)*

Advanced learners exhibited longer reading times on common interpretations than on distributive interpretations, but only for specific segments: *de* NP, *est-ce que* and *tous les* N, as shown in Table 3. Intermediate learners exhibited no significant differences.

Thus, reading time differences are (largely) confined to (segments immediately following) the introduction of ambiguity associated with the interpretation of the restriction of the wh-cardinality expression. There are also effects on the verb, with greater reading times on common interpretations. This is plausibly due to a reconsideration of common interpretations by subjects before they answer.

3.2 Discussion

It is generally assumed that all available information is put to use in order to maximize the parse up to the limits of the allowable relations. Context, therefore, should significantly (i.e., measurably) bias scope ambiguity resolution, *if the flow relations in the processor allow it.* We found, instead, a *bias* that reflects the structure of interpretations. This is highly suggestive of the autonomy of syntax in L2 processing and the limits on the role of context in sentence processing. The flat pattern with the intermediate group is explained if failure of the parse (prior to the acquisition of the *de* morphology) eliminates the constraining power of syntax on the range of interpretive possibilities. Acquisition of the Case-theoretic import of the *de* morphology, which licenses restrictions in situ, leads to asymmetrical access to interpretations in advanced learners (only). If the developing grammar interacts with a universal performance theory in such a way, we expect L1 scope processing to be similarly constrained in the limits of parametric variation.

3.3 Natives and non-natives

English natives (n = 32) produced significantly longer reading times on common than on distributive interpretations for the auxiliary in the C position only.

	common 59 cases	distributive 92 cases	t-test statistics	
how many	439.71 ms.	455.71 ms.	t(149) = .32,	p = .746
NP	396.47 ms.	334.66 ms.	t(77.73) = 1.57,	p = .119
aux	423.49 ms.	351.46 ms.	t(149) = 2.60,	p = .010
all the N	761.73 ms.	593.37 ms.	t(149) = 1.27,	p = .207
thus	593.20 ms.	503.70 ms.	t(149) = .85,	p = .395
verb	1029.68 ms.	668.94 ms.	t(83.41) = 2.51,	p = .014

Table 5: Reading times-*English Natives* (n = 32):
Common versus distributive answers

French natives (n = 16) show asymmetrical scope resolution between the common and distributive interpretations on the subject quantifier in the Specifier of I only.[2]

	common 34 cases	distributive 41 cases	t-test statistics	
combien	454.14 ms.	418.19 ms.	t(73) = 1.09,	p = .281
de NP	409.35 ms.	355.71 ms.	t(73) = 1.08,	p = .286
est-ce que	422.09 ms.	388.76 ms.	t(73) = .75,	p = .455
tous les N	644.85 ms.	421.22 ms.	t(41.49) = 2.16,	p = .036
aux	511.15 ms.	546.97 ms.	t(73) = .40,	p = .692
donc	516.50 ms.	456.15 ms.	t(45.39) = .99,	p = .355
verb	1535.00 ms.	1078.83 ms.	t(47.38) = 1.80,	p = .078

Table 6: Reading times-*French Natives* (n = 16):
Common versus distributive answers

Thus, interpretation-based contrasts in reading times of cardinality interrogatives are detected on an earlier segment in our English natives than in our French natives. Such a difference is consonant with differences in relative computational complexity between French and English in access to common interpretations. It is also consonant with results of Villalta (1999, 2003) who found differences in rates of suppliance of common answers to cardinality interrogatives in English and French. The reading time effects were limited to one segment in English and French natives. But, advanced L2 learners' patterns showed an effect in reading times spread over several segments. This lower-level difference is possibly due to slower L2 processing.

4. Conclusion

The results from our task suggest that the behavior of both natives and non-natives requires a structural (economy-driven) theory of scope resolution interacting with language-specific parameters. Patterns found in L2 development do not follow from greater familiarity with lexical items, but require a grammatical explanation. We argued that these asymmetries commit us to a structural theory of computations with repercussions for the role of context.

The simplest explanation for our results seems to be that sentence processing involves a (largely) universal parser, *pace* the parameterized functional lexicon. Enhanced L2 parsing competence arises with the development of L2 lexical

[2] Two outlying tokens were removed from the count of the French native group, with a reading of over 3000 milliseconds for the subject expression. These aberrant measures were well above two standard deviations.

hypotheses developed when the L1 hypotheses fail to characterize the input in the Universal Grammar principles (Schwartz and Sprouse 1994, 1996). L2 processing, therefore, obeys the same theory of performance as native processing, except for the growth of a target language appropriate grammar. Our data are strongly suggestive of this model.

In the absence of a universal parser, greater context-dependency of L2 processing is expected for properties of the target language that the L1 grammar does not license. Therefore, evidence that L2 processing is narrowly constrained by flow relations determined by Universal Grammar threatens the hypothesis of distinct grammar-parser-context relations in L1 and L2 acquisition.

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On Children's Knowledge of Scalar Implicatures
Evidence from Hebrew coordination

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1. Introduction

There has been much discussion about children's knowledge of scalar implicatures. Some researchers have found evidence for early knowledge of these implicatures, i.e. Papafragou and Musolino (2003) for numerical scales, Chierchia, et al. (1998) for <and, or>. Other researchers have argued that this skill is late developing, i.e. Papafragou (to appear) for scalar implicatures associated with the scales <finish, start/begin>, and <completely, half/halfway>, Papafragou and Musolino (2003) for <all, some>, <finish, start>, Noveck (2001) for <must, might> and <all, some>, Musolino and Lidz (2002) for <not any, not every>, Chierchia , et al. (2001) for <and, or>.

In our investigation we bring evidence from children's first language acquisition of the Hebrew coordinators of conjunction (Hebrew *ve*) and disjunction (Hebrew *o*). Our main claims are: (i) Children's knowledge of scalar conversational implicatures differs from adults'; (ii) Of the three elements of knowledge needed to calculate a scalar implicature, children demonstrate knowledge of truth conditions and the maxim of quantity. They have difficulty with scales; and (iii) This difficulty results from an immature general cognitive ability to process complex relations and not from lack of pragmatic knowledge. The evidence we bring here is from 5 of 8 experimental conditions of a larger study on Hebrew coordination.

2. Theory of conversational implicature
2.1 Maxim of Quantity

Grice (1975) introduced the concept of conversational implicature to explain some parts of meaning which speakers convey to their hearers which is not part of the literal, or semantic, meaning of the words uttered. He proposed that interlocutors operate on the basis of a so-called 'Cooperative Principle', as described in (1):

(1) *Cooperative Principle* (Grice, 1975)
Maxims followed by interlocutors enabling cooperative communication including the Maxim of *Quantity*

In obeying this cooperative principle speakers make use of four maxims: relevance (originally called relation), quality, manner and quantity. Scalar implicatures, the subject of our investigation, arise from the maxim of quantity, as defined in (2):

(2) *Maxim of Quantity*
The amount of information provided by the speaker should fit the situation: not too much and not too little.

An example of a conversational implicature arising from the maxim of quantity appears in (3):

(3) *Example of conversational implicature arising from Maxim of Quantity*
Shopkeeper: We have that shirt in green and in blue.
Customer to shopkeeper: I like the blue.
Conversational implicature calculated by shopkeeper: the customer wants only the blue shirt, otherwise she would have given more information and mentioned the green as well.

In this example, the customer gives a limited quantity of information. By not saying more, the shopkeeper calculates the implicature that the customer wants **only** what she mentioned, nothing more.

Now let us turn to scalar quantity implicatures, specifically those associated with coordination.

2.2 Scalar implicatures of coordination

Scalar implicatures may be roughly defined as in (4):

(4) *Scalar implicature*
Implicature arising from the choice of a weaker member of an entailment scale.

If we consider the scalar implicature associated with disjunction, the knowledge involved includes: (i) truth conditions of coordinators; (ii) entailment scale, <and, or>; (iii) cooperative principle and the maxim of quantity.

The truth conditions of the coordinators are given in (5):

(5) *Truth conditions of coordinators*
(i) conjunction (*ve/and*): all conjuncts true
(ii) disjunction (*o/or*): at least one (but possibly all) disjuncts true

We can define an entailment scale as in (6).

(6) *Entailment scale* (Horn, 1972; Levinson, 2000)
An entailment scale <S, W> may be defined where S is the stronger term and W is the weaker term and S entails W but W does not entail S.

The specific scale that we are interested in involves conjunction and disjunction which form an entailment scale: <*and, or*> since the truth conditions of *and* entail the truth conditions of *or* but not vice versa. This is illustrated in (7):

(7) *Example of entailment scale <and,or>*
   a. Joe drinks tea with milk and lemon.
   b. Joe drinks tea with milk or lemon.

(7a) will be true provided that it is true that Joe drinks tea with milk and it is also true that Joe drinks tea with lemon. (7b) will be true provided that at least one of these is true, that is, if it is true that Joe drinks tea with milk or it is true that Joe drinks tea with lemon.

In the case that Joe takes tea with both milk and lemon, the conditions making (7a) true, (7b) must also be true, in other words, (7a) entails (7b). In the case that it is true that Joe takes tea with milk, but false that he takes tea with lemon, (7b) will be true, but (7a) will be false. In other words, (7b) does not entail (7a). We can present the implicature arising from this one way entailment relationship as in (8):

(8) *Scalar implicature arising with the use of disjunction*
   By uttering (7b) the speaker implicates that she knows that (7a) is false.

Thus, when disjunction is used the hearer calculates a scalar implicature and infers that the speaker did not use conjunction because she knows that it is not the case that both disjuncts are true. If the speaker knows that both disjuncts are true, and chooses to use disjunction, the utterance will be judged infelicitous.

Note that disjunctions may also be judged infelicitous if only one disjunct is true. Possibly, the mention of the false disjunct violates the maxim of relevance, which gives rise to a non-scalar implicature. An example of a violation of the maxim of relevance, that is, ignoring this non-scalar implicature, is given in (9):

(9) *Infelicitous disjunction when one disjunct true (violation of Maxim of Relevance)*
   Situation: I am holding a pen.
   Statement: I am holding a pen **or** a pencil.

We now turn to our investigation.

3. Hypotheses and predictions

We formulated the hypotheses described in (10):

(10) *Hypothesis 1*
   Young children demonstrate close to adultlike knowledge of truth conditions of coordinators.
   Hypothesis 2
   Young children lack the general cognitive ability of comparison needed to understand scales.
   Hypothesis 3
   Young children demonstrate pragmatic knowledge.

The experimental predictions that follow from these hypotheses are stated in (11):

(11) *Prediction 1*
Young children reject false conjunctions at adultlike levels (from Hypothesis 1)
Prediction 2
Young children reject false disjunctions at adultlike levels (from Hypothesis 1)
Prediction 3
Young children accept true disjunctions when both disjuncts are true, unlike adults, because they do not calculate the scalar implicature (from Hypothesis 2).
Prediction 4
Young children reject true disjuncts when one disjunct is true (because of non-scalar implicature) (from Hypothesis 3)
Prediction 5
Young children reject infelicitous statements when the maxim of quantity is violated (and no scale is involved) (from Hypothesis 3)

4. Experimental methodology

In order to test our predictions we recruited 134 children aged 2;4-9;6 and 17 adults who served as a control group. The actual numbers of children of each age who participated in each experimental condition appear in Table 1. Note that Condition 4 was administered to the youngest group only, because of time constraints. There were roughly equal numbers of males and females in the groups. All participants were monolingual native Hebrew speakers.

Age groups	**Conditions 1 and 2**	**Condition 3**	**Condition 4**
2;7-3;6	17 (35.8)	9 (35.4)	10 (33.4)
3;7-4;6	31 (48.8)	27 (48.6)	0
4;7-5;6	11 (61.2)	8 (62.1)	0
5;7-6;6	6 (71.5)	7 (71.5)	0
6;7-7;6	20 (85.1)	21 (84.8)	0
7;7-8;6	21 (96.3)	20 (96.4)	0
8;7-9;6	19 (108.5)	19 (108.5)	0
Adults	16 (335.3)	17 (333.2)	0
Total	141	128	10

Table 1 - Number of participants in experimental tasks (and mean ages in months)

For all experiments we used a judgment task (following Crain and Thornton, 1998). In some cases the task was a truth-value judgment task, in some cases a judgment of felicity. There were 10 target items and 5 filler items for each condition. Stimuli were picture descriptions provided by a puppet.

For Condition 1, testing Prediction 1, we presented a truth-value judgment task. Targets were false conjunctions; the fillers were true conjunctions. Acceptance of target items reflects lack of knowledge of the falsifying conditions of conjunction. A sample item appears as (12).

(12) *Example – Condition 1*

Picture description: Count stands eating an apple. Bed at side.

Investigator: *hine mar sofer. Hu omed hu oxel tapuax hu lo shoxev al hamita. nesa, ma kore batmuna?*
"Here's Count. He stands, he eats an apple, he doesn't lie on the bed. Nessa, what's happening in the picture?"

Puppet: *mar sofer shoxev ve oxel tapuax.*
"Count lies down and eats an apple."

For Condition 2 testing Prediction 2, we used a truth-value judgement task. Again targets were false disjunctions and fillers were true conjunctions. Acceptance of target items in Condition 2 reflects lack of knowledge of the falsifying conditions of disjunction. An example of a target item in Condition 2 is given in (13):

(13) *Example – Condition 2*

Picture description: Cookiemonster eating apple and cookies.

Investigator: *hine ugifletset. hu oxel tapuax. hu oxel ugiyot. hu lo oxel senvich hu lo oxel banana.*
"Here's Cookiemonster, He's eating an apple. He's eating cookies. He's not eating a sandwich. He's not eating a banana."

Puppet: *ugifletset oxel senvich o banana.*
"Cookiemonster is eating a sandwich or a banana."

For Condition 3 testing Prediction 3 we used a felicity judgment task. With targets being true disjunctions (both disjuncts true) and fillers, using false disjunctions. In this condition acceptance of target items reflects lack of knowledge of the scalar implicature. An example is provided in (14):

(14) *Example – Condition 3*

Picture description: Bigbird wearing a coat and a a scarf.

Investigator: *hine tsiporet. hi loveshet mIil . hi loveshet tsIif.*
"Here's Bigbird. She is wearing a coat. She's wearing a scarf."

Puppet: *tsiporet loveshet mIil o tsIif.*
"Bigbird is wearing a coat or a scarf."

Condition 4 testing Prediction 4 used a truth-value judgement task. The targets were true disjunctions (3 items with the first disjunct true, 3 items with the second disjunct true, 4 items with both disjuncts true, while the fillers were false disjunctions. (N.B. This condition administered to youngest participants only)

This task was originally designed to replace condition 3 for the youngest participants. Unfortunately, time prevented us from splitting these two types of target items into two completely separate conditions. The items with two true disjuncts were similar to those of Condition 3. In (15) we give an example of the items with only one true disjunct:

(15) *Example – Condition 4*

Picture description: Fly eating a cookie. On a plate at the side are cookies and a pear.

Investigator: *hine zvuv. hu oxel ugiya. hu lo oxel agas. nesa ma kore ba tmuna?*
"Here's a fly. He's eating a cookie he doesn't eat a pear. Nessa what's happening in the picture?"

Puppet: *ha zvuv oxel ugiya o agas.*
"The fly eats a cookie or a pear."

5. Results

In Table 2 we present the results of Condition 1: the percentage acceptance of false and true conjunctions.

Age Group	Target items accepted	Filler items accepted
3	17.8% (32/180)	88.9% (80/90)
4	20.0% (48/240)	89.2% (13/120)
5	7.0% (7/100)	98.0% (48/50)
6	2.9% (2/70)	94.3% (33/35)
7	2.5% (5/200)	98.0% (98/100)
8	0.5% (1/200)	98.0% (98/100)
9	2.0% (4/200)	97.0% (97/100)
Adults	1.3% (2/160)	96.3% (77/80)

Table 2 - Condition 1: Acceptance of false (target items) and true (filler items) conjunctions *(ve/aval)*

Even 3-year olds reject false conjunctions over 80% of the time. With increased age, the children's behavior approaches adult levels. These results support Prediction 1 of Hypothesis 1. Statistical analysis (ANOVA) with age and condition as dependent variables shows that age groups 3 and 4 differ significantly from adults (by accepting more false conjunctions) while age groups 5, 6, 7, 8, 9 do not differ from adults.

Table 3 shows the results of Condition 2: the percentage acceptance of true and false disjunctions:

Age Group	Target items accepted	Filler items accepted
3	16.7% (30/180)	92.2% (83/90)
4	11.7% (28/240)	94.2% (113/120)
5	3.0% (3/100)	98.0% (49/50)
6	1.4% (1/70)	100% (35/35)
7	2.5% (5/200)	100% (100/100)
8	0.0% (0/200)	98.0% (98/100)
9	0.5% (1/200)	100% (100/100)
Adults	1. 9% (3/160)	95.0% (76/80)

Table 3 - Condition 2: Acceptance of true and false disjunctions (*o/or*)

Here too, from 3 years, children, like adults, reject false disjunctions over 80% of the time. However, they do not yet demonstrate adult consistency (as shown by ANOVA with condition and age as dependent variables). With increased age, behavior approaches adult levels (and ANOVA shows no significant difference between age groups 5,6,7,8 and 9 and the adult group). These results support Prediction 2 of Hypothesis 1.

Table 4 shows the results on Condition 3: percentage acceptance of true, but infelicitous disjunctions (due to the scalar implicature). Young children (up to age 7), **unlike** adults accept infelicitous true disjunctions with two true disjuncts over 80% of the time. Behavior gradually approaches adult levels but is still far from adultlike at 9 years. ANOVA shows all children's age groups significantly differ from adults. These data support Prediction 3 of Hypothesis 2.

Age Group	Target items accepted	Filler items accepted
3	89.0% (89/100)	8.0% (4/50)
4	88.2% (195/220)	20.9% (23/110)
5	87.5% (70/80)	2.5% (1/40)
6	85.0% (51/60)	0.0% (0/30)
7	81.0% (162/200)	4.0% (4/100)
8	42.5% (85/200)	0.0% (0/100)
9	49.5% (99/200)	0.0% (0/100)
Adults	2. 9% (5/170)	0.0% (0/85)

Table 4 - Condition 3: Acceptance of true infelicitous disjunctions (*o/or*) (scalar implicature)

In Table 5, we can see the results of Condition 4, again the acceptance of true infelicitous disjunctions, but this time the target items also included infelicitous disjunctions with only one true disjunct:

Age Group	True Target items	False Filler items
3	61.8% (68/110)	25.5% (14/55)

Table 5 - Condition 4: Acceptance of true infelicitous disjunctions

Table 5 shows us that 3 year olds accept true disjunctions (one or all true disjuncts) the majority of the time. We have already seen in Table 4 that young children accept true disjunctions with two true disjuncts.

In Table 6, we see a breakdown of the responses of Condition 4 into responses to disjunctions with one true disjuncts, versus disjunctions with two true disjuncts. The responses for items with two true disjuncts are similar to the responses of this age group to Condition 3. Of special interest are the responses to those items with only one true disjunct. The children accepted the disjunctions with only one true disjunct far less often than those with two true disjuncts, in fact only half as many

times. We assume that the children rejected these items because they are able to calculate the relevance implicature, which does not require the complex processing of scalar implicatures. Thus, children show earlier knowledge of non-scalar implicature than scalar implicature, our results supporting Prediction 4 of Hypothesis 3.

	Acceptance of disjunctions ignoring non-scalar (relevance) implicature - one true disjunct	**Acceptance of disjunctions ignoring scalar implicature - two true disjuncts**
2;7-3;6	47.0% (31/66 items)	88.6% (39/44 items)

Table 6 - Condition 4: Acceptance of true infelicitous disjunctions with one true disjunct and with two true disjuncts (breakdown of second column Table 5)

Finally, Table 7 presents spontaneous corrections made by the children during the experiment, showing that they have knowledge of the Maxim of Quantity.

Thus, although children have problems with scalar implicatures (as shown in Tables 4 and 6), we do have evidence that young children can calculate implicatures, not only based on relevance, but also based on quantity. That is, young children reject statements on the basis of inadequate quantity of information, as exemplified in Table 7. This supports Prediction 5 of Hypothesis 3.

Age	**Item**	**Puppet's description**	**Correction**
2;11	IF5	*Elmo ve deizi oxlim* "Elmo and Daisy eat"	*Hu oxel melafefon ve hi oxelet tapuax.* "He eats (a) cucumber and she eats (an) apple."
3;3	IF2	*Oskar oxel banana ve ugiya* "Oscar eats (a) banana and (a) cookie."	*Hu oxel harbe ugiyot.* "He eats lots of cookies."
4;3	Warm-up	*Q: ma loveshet tirza?* *A: Xatsait* Q: "What does Tirza wear?" A: "(a) skirt"	*Lo, gam xatsait ve gam xultsa* "No, also (a) skirt and also (a) shirt."
7;6	IIF2	*Elmo rodef axarei ha kadur aval ha kadur boreax lo.* "Elmo chases after the ball but the ball escapes him."	*Xaser she ha kadur boreax lo she hu rats maher* "missing that the ball escapes him when he runs fast"

Table 7 - Evidence for children's knowledge of the Maxim of Quantity

6. Discussion

We may summarize our results as follows: Adults show knowledge of truth conditions and scalar implicature, with rejection rates for semantic and pragmatic unacceptability similarly high. Children show knowledge of truth conditions: by age 3: 80% adultlike responses; by age 5: completely adultlike. This supports our

Prediction 1 of Hypothesis 1. With regard to scalar implicature, no adultlike knowledge is shown, even by 9 years. This supports our Prediction 3 of Hypothesis 2. With regard to non-scalar implicature, knowledge begins to be evident at age 3, supporting our Prediction 4 of Hypothesis 3. By age 3 children show knowledge of the Maxim of Quantity as evident by their corrections, supporting our Prediction 5 of Hypothesis 3.

Recall that there are three elements necessary to calculate scalar implicatures: (i) knowledge of truth conditions; (ii) knowledge of the maxim of quantity ; (iii) ability to compute entailment scales.

We have shown that children show knowledge of truth conditions from the age of 3, adultlike levels reached by the age of 5. Therefore, the failure to calculate scalar implicatures is not due to lack of knowledge of truth conditions. Furthermore, children demonstrate knowledge of non-scalar implicatures (arising from relevance) far earlier than scalar implicature. Thus, failure to calculate scalar implicatures is not due to an inability to calculate implicatures (pragmatics). Finally, children show knowledge of the Maxim of Quantity by the age of 3 as evidenced by corrections in our study. Thus, the failure to calculate scalar implicatures is not due to lack of knowledge of Maxim of Quantity (pragmatics). We therefore conclude that the problem is in the ability to compute inplicatures involving entailment scales.

An analysis of the computational complexity of scalar implicatures, in Section 7, explains why these implicatures are acquired so late.

7. Processing scalar implicatures

In order to understand why scalar implicatures prove difficult for young children, let us now take a closer look at what need to be considered in order to calculate a scalar implicature. Recall that conjunction and disjunction form an entailment scale because if a sentence using 'and' is true, the identical sentence substituting 'or' for 'and' will always be true, but not vice versa. In order to work out just how complex the calculation of an implicature based on such a scale can be, we make use of Halford, Wilson and Phillips (1998) relational complexity metric, presented in (16).

(16) *Relational complexity metric* (Halford, Wilson and Phillips, 1998)
Difficulty of processing dependent on the number of elements to be processed simultaneously

Note that complexity is determined by the number of elements to be processed in parallel. Processing elements in sequence will not result in increased complexity if each step in the sequence has low dimensionality, or few elements to be processed in parallel. Table 8 describes the 4 levels of dimensionality. Note that the highest level is quaternary where four level elements are processed simultaneously. This level is predicted to be mastered only at 11 years, older than the oldest child participants in our study. Scalar implicatures are at this highest level, as we now explain.

The calculation of a scalar implicature, based on the description in (16) requires consideration of several elements described in (17) through (20). In (17) – (20) we refer to relations for sentences A and B.

Firstly, as we need to consider the entailment scale, the first part is that conjunction entails disjunction, a binary relation.

Complexity of relation	**Dimen-sionality**	**Predicted peak age (in years)**	**Structure of relational instances**	**Examples**
Unary	1	1	R<a>	attributes, e.g. red(flower)
Binary (also univariate functions and unary operations)	2	2	R<a,b>	location, e.g. on (book, table) entailment, truth conditions of negation
Ternary (also bivariate functions and binary operations)	3	5	R<a,b,c>	transitivity, e.g. Taller than (John, Mark, Joe), where we derive that John is taller than Joe. truth conditions of coordinators
Quaternary (also trivariate functions and ternary operations)	4	11	R<a,b,c,d>	proportion e.g. a:b = c:d. scalar implicatures

Table 8 - Predicted age of peak ability, structure of relations and examples of relations of varying complexity

(17) *Entailment* (binary relation - binary dimensionality)
For A entails B, (i.e whenever A is true, B must be true) two elements need to be considered:
(i) truth-value of A and (ii) truth-value of B

We must also consider that the disjunction does not entail the conjunction so we need negation as described in (18) at binary level, also relatively easy.

(18) *Negation* (unary operation - binary dimensionality)
For negation of A, two elements need to be considered:
(i) truth-value of A gives (ii) truth-value of not A

From (18) it follows that if the truth value of A is true, the truth value of not A will be false, and vice versa.

Now these two characteristics of the scale, that conjunction entails disjunction but disjunction does not entail conjunction must be considered simultaneously, this can be seen as the entailment and the negation of the entailment feeding into a conjunction of ternary level, as described in (19).

(19) *Conjunction* (binary operation – ternary dimensionality)
For A and B, three elements to be considered:
(i) truth-value of A and (ii) truth-value of B give (iii) truth-value of A and B

The conjunction will only have a value of true if the first two truth values are true. This leads us to the scalar implicature in (20). Its processing is shown schematically in (21).

(20) *Scalar implicature* (following Levinson, 2000)
If A(S) entails A(W) (a binary relation / binary dimensionality) and A(W) does not entail A(S) (a unary function / binary dimensionality having scope over a binary relation / binary dimensionality), and A(W) is uttered (a unary relation / unary dimensionality), then the hearer calculates the implicature (a binary operation / ternary dimensionality) that the speaker knows that A(S) is not the case (a unary function / binary dimensionality negation having scope over a proposition).

(21) *Processing of scalar implicature*

a) Bigbird is wearing a coat **or** a scarf
(the weaker expression A(W) is uttered, raising a scalar implicature)

b) There are two sequential steps here first:

Negation of the second entailment (a *unary operation* having scope over a *binary relation* resulting in a *ternary level relation*)

Conjunction (a *binary operation at a ternary level*) of the two entailments (the first entailment, a *binary level relation*, the second negated entailment, a *ternary level relation*) together with the weaker expression (in our case *or*) being uttered resulting in a *quaternary level relation.*

The difficulty of the first step should be within the range of the children we tested, as ternary level relations are mastered at 5 years. the second step as a quaternary level relation we expect to pose difficulty even for our oldest child participants. The difficulty for children is simultaneously taking into account the elements of the second step (quaternary) of calculating the scalar implicature. According to Halford et al. (1998) operations with quaternary dimensionality are not mastered until age 11 (see Table 8).

Therefore, we propose that the difficulty in the scalar implicature comes from the processing difficulty, not from lack of knowledge of semantics or pragmatics. First let us consider previous explanations for the late development of scalar implicatures.

The *Pragmatic delay hypothesis* proposes that scalar implicatures are representative of pragmatic knowledge/development in general which develop late.

However, we find evidence for (some) early pragmatics, this argument ignores the specific need to understand scales which is not part of many pragmatic skills.

The *Reference set hypothesis* (Reinhart, 1999) proposes that children have difficulty constructing sets of alternatives and therefore guess. However, a) Why should there be a difference between constructing sets of alternatives for scalar versus non-scalar implicatures? and, b) Our participants do not show a guess pattern, but rather show NO evidence of scalar implicature until 8 years.

Our study adds weight to the argument that scalar implicatures are in fact late developing. In addition we identify why these types of implicatures are problematic for young children. We conclude that:

Children have early knowledge of truth conditions. They also have early knowledge of pragmatics - they correct statements based on violations of quantity and relevance. Children are able to construct sets of alternatives. Otherwise how do they correct and how do they judge statements as violations of quantity? The problem is that children have difficulty simultaneously processing the several elements needed to calculate scalar implicatures, even at 9 years. Further investigation is needed into non-scalar implicatures to further clarify the question of what parts of pragmatics are early developing and what parts are later developing and why.

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Contiguity in Phonological Acquisition[1]

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1. Introduction

This paper compares two typical phenomena in phonological development: Onset Selection in Truncation (OST) and Onset Cluster reduction (OC-red). Motivation for this comparison is that in both cases target onset segments compete for preservation in the child form. As hypothesised by among others Bernhardt and Stemberger (1998: 460) '[w]e expect to see the same reduction patterns in consonant clusters and in syllable deletion.' Previous reports show that sonority and place of articulation affect both processes in similar ways. On the other hand, the notion of contiguity implies a mismatch. Contiguity guides OST when sonority or place effects are indecisive (Stemberger et al. 1990), but contiguity effects are 'rare at best' in OC-red (Goad & Rose 2004). The aim of this study is to investigate this alleged mismatch under controlled circumstances. An experiment is reported upon designed to evaluate preservation patterns in OST. Results are compared with findings on OC-red for the same participants acquiring Dutch. It is shown that contiguity not only plays a key role in OST, but contrary to assumptions made so far, also in OC-red.

2. Background

Early child productions are restricted both in size and shape. At the word level, typically no more than a single trochaic foot is produced (*banána* as ['næna]). In general, 'prominent' syllables, being the stressed and word-final syllables, survive truncation, whereas weak non-final syllables are omitted (Echols & Newport 1992, Pater 1997).[2] At the syllable level, singleton Consonant-Vowel structures are preferred, thus avoiding branching constituents (*blue* as [bu:]). Within Optimality Theory (Prince & Smolensky 1993), the following constraints can be formulated:

(1) WORDSIZE: 'words (maximally) comprise a single trochee'[3]
*COMPLEX-ONS: 'no branching onsets'

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[1] Earlier versions of this paper were also presented at the Phonology Acquisition Workshop in Nijmegen, May 2003, and the Child Phonology Conference at UBC, July 2003. I am grateful to those audiences, the Utrecht Phonology group, the GALA 2003 audience, and particularly Joe Pater for useful comments. All shortcomings are my own.

[2] From an OT perspective, prominent syllable retention is attributed to a high ranking of STRESS-FAITH and ANCHOR-RIGHT I-O (Pater 1997).

[3] WORDSIZE is a cover term for constraints that ensure that the output comprise at most a single trochee, merging together a set of prosodic constraints: FTBIN, ALIGNLEFT, PARSE-σ (McCarthy & Prince 1995, see Pater 1997 for a discussion in L1).

In early child grammars the markedness constraints WORDSIZE and *COMPLEX are ranked high at the cost of violating segmental faithfulness MAX. Under this ranking the input provides a similar *choice* of onset segments for the child to produce in two different environments: OC-red (*blue*) illustrated in (2) and OST (*balloon*)[4] in (3).

(2)

/blu/	*COMPLEX	MAX
blu	*!	
☞ bu		*
☞ lu		*

(3)

/bəˈlun/	WORDSIZE	MAX
bəˈlun	*!	
☞ bun		**
☞ lun		**

On what basis the child selects the optimal onset and how selection strategies compare for OST and OC-red is the current focus.

A first influencing factor is sonority. Children typically prefer low sonority onsets due to a phonetically grounded fixed ranking of constraints (Barlow 1997, Gnanadesikan 2004). I adopt Pater's (1997) version of this ranking, as given in (4), also abbreviated as SON. The role of sonority in both OST and OC-red is illustrated in Dutch data in (5).

(4) *G-ONS»*L-ONS»*N-ONS»*F-ONS (G=glide; L=liquid; N=nasal; F=fricative)

(5) OST: *ballón* "balloon" /bɑˈlɔn/ → [ˈbomiː] Catootje [1;10.11]
OC-red: *bloemen* "flowers" /ˈblumə/ → [ˈbomiː] (CLPF)

In both examples the unmarked stop is preferred to the more marked liquid in onset position, showing that *L-ONS is ranked high in Catootje's grammar at this stage.

A second influencing factor is place of articulation. There is evidence that labial and dorsal segments are preferred to coronal segments (e.g., Fikkert 1994, Kehoe 1995, Pater & Barlow 2003), as exemplified in (6) for Dutch and English data.

(6) OST: *menéer* "man" /məˈner/ → [ˈmeə] Jarmo [2;1.8]
kadóotje "present" /kaˈdotʃə/→ [ˈkoʃə] Jarmo [2;3.9] (CLPF)
OC-red: *drive* → [ˈwaɪv][5] Julia [1;9.14] (P&B)

Place requirements may even outweigh sonority effects, as seen in the Julia data where labiality is maintained at the cost of selecting a high-sonority segment (Pater & Barlow 2003).

A third potential influencing factor is *contiguity*. Contiguity states that segments adjacent in the input should be adjacent in the output (McCarthy & Prince 1994). Stemberger et al. (1990) argue that contiguity matters for OST, but only when sonority cannot decide. Pater (1997) finds that contiguity is usually only disrupted in OST to replace an onset liquid and proposes that contiguity and sonority effects interact. It appears, therefore, that contiguity plays an active role in OST, the extent to which requires further investigation. Regarding OC-red, previous reports play down the role of contiguity (Goad & Rose 2004). Based on the literature, it seems then that contiguity forms a problem for the hypothesis that OST and OC-red result from similar underlying mechanisms. If contiguity (expressed in subscript) ranks

[4] Underlined consonants are competing onsets.
[5] Pater & Barlow (2003: 509) assume that /r/ is underlyingly labial in American English.

above sonority constraints for OST as in (7), then the same ranking should hold for OC-red in (8), which generates an unattested form according to previous studies.

(7)

/$b_1ə_2'l_3u_4n_5$/	I-CONTIG	*L-ONS
$b_1u_4n_5$	*!	
☞ $l_3u_4n_5$		*

(8)

/$b_1l_2u_3$/	I-CONTIG	*L-ONS
b_1u_3	*!	
💣 l_2u_3		*

A clear example of a contiguity mismatch is found in Jarmo's speech at [2;2.6] (Fikkert 1994) where contiguity is obeyed in *konijntje* "rabbit" produced as ['nɛɪtjə], but disrupted in *knippen* "to cut" as ['kɛpɔ]. To gain insight into such cases, an experiment is conducted in which OST is studied under strictly controlled circumstances, considering conditions not yet met in previous reports. The design and results are presented in the next sections.

3. Experimental study: method & material

3.1 Data collection and stimuli

Data were collected in two different settings: (1) Naturalistic: elicitation of existing truncation-prone words and words with onset clusters; (2) Experimental: imitation of nonsense words susceptible to truncation (stress patterns WSW and SWW, see e.g., Kehoe 1995 on truncation-prone words in L1) and with a CV.CV.CV syllable structure. Competing onsets are controlled for degree of sonority or place of articulation, such that the least marked competitor is always in the noncontiguous position. Observe, for example, in /di'namo/ noncontiguous /d/ is less marked than contiguous /n/ in terms of sonority; in /'mikado/ noncontiguous /k/ is less marked than /d/ regarding place. This way, noncontiguous OST is essentially provoked. See (9) for the list of nonsense words, and note that these do not involve onset clusters. OC-red is therefore examined in existing words only.

(9)

Sonority:	**WSW**	**SWW**
Stop vs. Nasal	di'namo	'patina
Stop vs. Appr	to'jota	'pityla
Fric vs. Nasal	so'nata	'byfimo
Nasal vs. Fric	ni'sota	×

PoA:	**WSW**	**SWW**
Lab vs. Dor	po'kimi	'tikapi
Dor vs. Cor	ka'toma	'mikado
Lab vs. Cor	mo'nako	'domina

3.2 Participants and procedure

A total of 22 children (12 female; 10 male) took part in the experimental study on OST, ranging from [1;8] to [3;3], with a mean age of [2;3]. The naturalistic study on OC-red involves 10 children from the same group. Insufficient OC-red data were collected for the other children. All participants are monolingual speakers of Dutch.

Spontaneous speech was prompted by reading picture books. Nonsense words were presented as characters in picture books and figures in a self-made board game. In the game, the child was given a card depicting a fantasy character, asked to repeat its name, find the matching picture on the board, and place the card on top. The aim was to encourage at least 3 productions of each nonsense word. Recordings took

place in a quiet room either in a lab, at home or at a day-care centre. All recordings were made using a DAT recorder and a portable microphone.

3.3 Data processing

Child productions were analysed in PRAAT (http://www.fon.hum.uva.nl/praat/) and transcribed by two raters independently, one of whom the author, using the International Phonetic Alphabet (IPA). Inter-rater reliability was on average 0.87. Differences were resolved by consensus, and otherwise by a third trained rater. Both type and token counts were carried out for all child productions. Types were calculated as follows: per process (e.g., truncation) each token of a certain type is scored as undergoing the process or not. The total of tokens undergoing the process is summed up (e.g., 4) and divided by the overall total of tokens of that type (e.g., 10), giving the type value (4/10=0.4). The contribution of this method is that within-child variation is considered, thus presenting the data as realistically as possible.

4. Onset Cluster Reduction

4.1 Results OC-red

Results are discussed for 7 out of 10 children involved in the OC-red study. These participants were still highly productive in reducing clusters (more than 75% of the time). Recall that onset clusters are targeted in existing words only. For analysis of OC-red patterns I distinguish between (1) Obs(truent)+ Son(orant) clusters; (2a) /s/+Son clusters; and (2b) /s/+Obs clusters. These subtypes differ in their underlying structural representations. Obs+Son clusters are branching onsets, whereas /s/+C clusters arguably are not. The latter type can violate the Sonority Sequencing Principle (SSP), which states that branching onsets maximally rise in sonority. Hence /s/ is claimed to be extra-syllabic (e.g., Trommelen 1984 on Dutch). By analysing these subtypes separately, children's possible awareness of underlying prosodic structure is taken into account. For each type of onset cluster, the dominant surviving member is given per participant in (10).

(10)

	OBS+SON	/s/+SON	/s/+OBS	*OC-red. pattern*
Charlotte	OBS	/s/	OBS	**SONORITY**
Boris	OBS	SON	OBS	**MIXED**
Emma	OBS	SON	OBS	
Thomas	OBS	SON	OBS	
Hannah	SON	SON	OBS	**!CONTIGUITY!**
Len	SON	SON	OBS	
Saar	SON	SON	OBS	

Both the Sonority and Mixed pattern are well-known child OC-red patterns and, accordingly, (10) shows that both are attested in this study. The Sonority pattern entails that clusters are reduced on the basis of sonority. In the Mixed pattern, sonority alone cannot explain all patterns: /s/+Son clusters are reduced to Son, the *more* sonorous segment (views differ on what drives this pattern, which will be

discussed below). Despite the fact that the Contiguity pattern is rarely mentioned in previous reports, considerable evidence is found for it here. Three out of seven children predominantly retain the contiguous member in their onset cluster reductions. In order to illustrate the robustness of these results, Figure 1 gives the percent reduction to the second member of the cluster ($C_1C_2 \rightarrow C_2$) per child for all onset clusters, narrowing down to particular kinds of onset clusters.

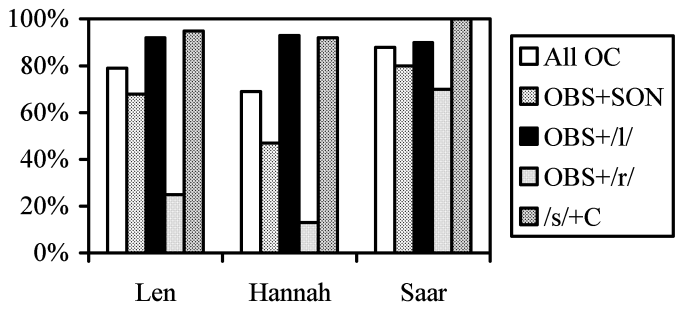


Fig. 1: % Types OC-red to C2

Notice that reduction to C2 for Obs+Son clusters is high as it is, however, when separating Obs+/l/ and Obs+/r/ results are even more striking. For Obs+/l/ clusters, reduction to C2 peaks for all 3 participants, whereas for Obs+/r/ clusters reduction to C2 is much less prevalent.[6] This is not surprising since /r/ typically emerges late in children's sound repertoire (apical or uvular trilled rhotics in onset position appear by age 3, see Beers 1995). Here the tendency to preserve C1 is stronger by a higher ranked *RHOTIC. A sample of the data from these participants is given below.

(11)

Len [1;10.10–1;10.24]	Hannah [1;10.29–1;11.6]	Saar [1;11.8–2;0.8]
blɑt → [lɑt]	blatʃə → [latʃə]	blum → [lun]
klɔk → [lɔk]	klɔk → [lɑχk]	klɑʊn → [lantʃ]
klɪmə → [lɪmə]	draɪə → [laɪə]	trɛɪn → [lɛɪn]
vlixtœʏx → [litœʏx]	vlixtœʏx → [liχtœʏχ]	vlix → [liχ]
sxɪlpɑt → [xopat]	sxunə → [χuna]	xrovər → [loəwa]
slɑk → [lɑk]	slapə → [lapə]	slapə → [lapə]

4.2 Discussion of OC-red

The results confirm both the Sonority Pattern (e.g., Fikkert 1994, Barlow 1997, Gnanadesikan 2004) and the Mixed Pattern (e.g., Pater & Barlow 2003, Goad & Rose 2004) in children's OC-red patterns. Surprisingly, however, considerable evidence is also found for the Contiguity Pattern in OC-red. This finding is intriguing in that previous reports describe this pattern as being very infrequent at best (Goad & Rose 2004, Bernhardt & Stemberger 1998). Nevertheless, there is more support for the contiguity pattern in L1 literature than made out to be, though a

[6] Note that Saar even reduces Obs+/r/ clusters to the contiguous member in up to 70% of the time. The rhotic is still avoided, however, by substitution with either /l/ or /ʊ/ in most cases.

formal account is lacking. For Dutch, Fikkert (1994: 79) points out that one subject in particular, Leonie, 'pays attention to the second part of the cluster'. Also on Dutch, Jongstra (2003) finds cases of C2 consistent realisation in Obs+Son clusters (/tʊ/, /kʊ/, /kl/, /kn/, /xr/, /xl/, /fl/). In fact, child 8 in her study has overall C2 realisations. Lléo and Prinz (1996) show that a child, María, acquiring Spanish has 84% reduction to C2. Finally, subject 12 acquiring English in Chin and Dinnsen (1992) retains C2 consistently.

The role of contiguity is also supported in adult languages. Comparable contiguity effects are seen in loanword adaptations, for example, in Finnish cluster-initial loans from Swedish (Fleischhacker, in prep.):

(12) (S) *klister* → (F) liisteri 'paste'
(S) *strand* → (F) ranta 'waterfront'

The effective role of contiguity may be attributed to a general tendency to preserve as much of the target syllable structure as possible, thus being maximally faithful to the input, reflected in both child and adult language. The role of contiguity has obviously been underestimated in L1 studies and an account is necessary.

4.3 Previous analyses of OC-red

Prior to proposing an analysis for the present results, I discuss two recent studies on OC-red: Pater and Barlow (2003) and Goad and Rose (2004). Both studies have similar accounts for the Sonority Pattern (/sl/→[s]), but hold different views on the Mixed Pattern (/sl/→[l]). Crucially, neither account can deal with the Contiguity Pattern.

P&B present a sonority-based approach. Non-sonority-based reduction patterns are attributed to other conflicting constraints typically active in early L1, such as *FRIC, MAXLAB, *DOR. In their account for the Mixed Pattern, onset /s/ is avoided by a high ranking of *FRIC. The relevant ranking is given in (13).

(13)

/sl/	*COMPLEX	*FRIC	*L-ONS
sl	*!	*	*
s		*!	
☞ l			*

Conversely, G&R argue that apart from sonority, the child's growing awareness of underlying prosodification is crucial in OC-red. They propose that two reduction patterns exist: the Sonority Pattern and the Head Pattern. OC-red is a matter of selecting the head of the input cluster. In the Sonority Pattern cluster headedness is determined by sonority (/sl/→[s]), in the Head Pattern by (mature) underlying syllable structure (/s_{app}l/→[l], i.e., /s/ is an appendix). Two constraints play an important role in the G&R analysis:

(14) *APPENDIX-LEFT: 'no appendix word-initially'
MAXHEAD(ONSET): 'select the head of a cluster'

G&R assume that /s/ in mature /s/+C clusters is a left-edge appendix, and that branching onsets are universally left-headed (Kaye et al. 1990). In their view, at the Sonority stage 'headedness' for input /s/+Son clusters is incorrectly ascribed to /s/ by sonority. In the Head stage, headedness depends on (mature) prosodic UR. The /s/ is analysed as an appendix (outside the onset) hence OC-red goes to Son (15: as in G&R)

(15)

/sl/	*COMPLEX	*APP-L	MAXHEAD	MAX
sl		*!		
s			*!	*
☞ l				*

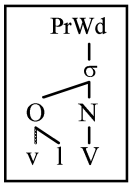
Neither the P&B nor G&R analyses can deal with the Contiguity Pattern. For both scenarios Obs+Son→Son (Obs ≠ /s/) should never be attested. The following section proposes an account that captures the Contiguity Pattern.

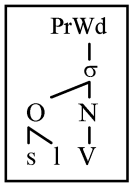
4.4 The Contiguity Pattern captured: a revised analysis of OC-red

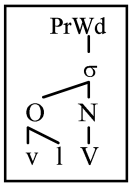
Now consider an account that attempts to do justice to the role of contiguity, while continuing to recognise the crucial observations that led to the P&B and G&R approaches. It would be straightforward to adopt the P&B approach, including I-CONTIG as an active L1 constraint, but it cannot be left at that. The data also provide evidence for G&R's *APP-L (see also Barlow 2001). Child Boris adopts the Mixed Pattern for OC-red (/s/+Son→Son, *sleutel* 'keys' as ['løtɔ]) and has acquired the lateral. He has 74% onset fricative avoidance, mainly by stop- or /h/-substitution. For Fric+Son clusters he reduces to Fric (*vlinder* 'butterfly'as ['hina]), despite /l/ not posing a problem. Under the scenario in (13), this output is unexpected. Boris seems to deal with Fric+Son and /s/+Son clusters in different ways, prosodifing /s/ as an appendix. At the same time, the appendix is avoided, hence left unrealised.

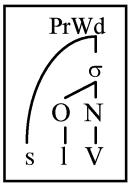
I propose that the so-called Sonority (Son-I) and Mixed patterns (Son-II) are in fact both Sonority Patterns. The Son-I Pattern results from a misrepresented yet fully specified underlying prosodic structure for /s/+Son clusters, contra G&R where dependents are underspecified in the Sonority stage. The underlying structure of /s/+Son clusters is overgeneralised as a Fric+Son branching onset, since both cluster types obey the SSP. Conversely, because /s/+Obs clusters violate the SSP, /s/ *is* identified as an appendix in this subtype. In turn, at the Son-II stage, children have an adult-like UR for all cluster types. Thus, it is assumed that underlying prosodification is complete from the start, as there is no reason to presume otherwise. In fact, convincing evidence is found for a Contiguity Pattern in OC-red, for which specification of the dependent is necessary. A potential trigger to overcome the misrepresented UR is the acquisition of tri-consonantal clusters, where only /s/ can be the first consonant of the cluster in Dutch. Arguably, realisation of CCC-clusters is late due to a general selection strategy, explaining the delayed intake of positive evidence for /s/ as an appendix in all cases. So, children with the Son-I Pattern have URs as in (16a) and (16b); those adopting the Son-II Pattern have

adult URs as in (17a) and (17b), identifying /s/ as an appendix in clusters; and children in the Contiguity stage can have either set of representations.

(16) a. 

b. 

(17) a. 

b. 

Further, it is assumed that both *COMPLEX and *APPENDIX-LEFT are undominated at this stage. URs as in (16ab) incur *COMPLEX violations; UR as in (17a) incurs a *COMPLEX violation, whereas (17b) a *APP-LEFT violation. Which member of the cluster is retained then depends on the ranking of SON constraints and I-CONTIG. In the Son-I stage URs are as in (16) and SON outranks I-CONTIG, as presented in (18).

(18)

/sl/	*COMPLEX	*APP-L	SON	I-CONTIG
sl	*!			
☞ s				*
l			*!	
/vl/	*COMPLEX	*APP-L	SON	I-CONTIG
vl	*!			
☞ v				*
l			*!	

In the Son-II stage the same ranking holds, however now URs are as in (17). Output [s_{app}] is ruled out by violation of *APP-L. Output candidate [s] *within* the onset violates highly ranked faithfulness constraint STROLE (McCarthy & Prince 1993) stating that Input-Output segments have identical syllable roles, here Appendix (cf. G&R's S=APP: in /s/+C the /s/ is optimally syllabified as an appendix).

(19)

/s_{app}l/	*COMPLEX	*APP-L	SON	I-CONTIG
sl		*!		
s		*!		*
☞ l			*	
/vl/	*COMPLEX	*APP-L	SON	I-CONTIG
vl	*!			
☞ v				*
l			*!	

In the Contiguity stage I-CONTIG dominates SON. URs can be as in (16) and (17).

(20)

/$s_{(app)}$l/	*COMPLEX	*APP-L	I-CONTIG	SON
s		(*!)	*	
☞ l				*
/vl/	*COMPLEX	*APP-L	I-CONTIG	SON
v			*!	
☞ l				*

5. Onset selection in truncation

5.1 Results OST

In this section the OST results are presented concerning nonsense words only. I consider only those child renditions that are truncated to one of the target competing onsets, for example, reduction WSW /ni'sata/ to either ['nata] or ['sata]; SWW /'byfimo/ to either ['byfo] or ['bymo]. Productions involving consonant harmony, coalescence, and other typical L1 strategies are excluded from this analysis.

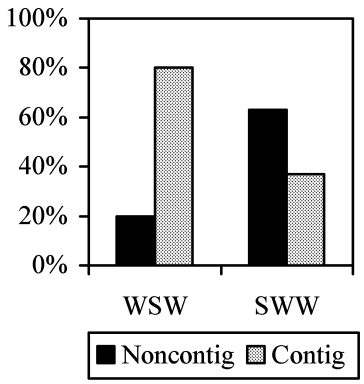


Fig. 2: % Selection Noncontig vs. Contig (types) for sonority

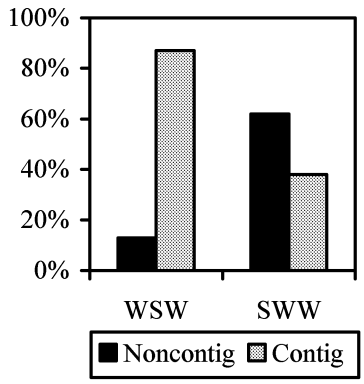


Fig. 3: % Selection Noncontig vs Contig (types) for place

Figure 2 above shows the results of OST with sonority controlled for. The percentage selection (for types) of the noncontiguous versus contiguous onset within the syllable is given for WSW and SWW nonsense words. Interestingly, it is usually the contiguous onset that is retained in WSW nonsense words (/ni'sata/ is ['sata]), thus maintaining the integrity of the stressed syllable, whereas it is more often the noncontiguous *less marked* segment that survives in the SWW stimuli (/'byfimo/ is ['byfo]), where contiguity is disrupted to meet sonority requirements. It appears that among the prominent syllables, contiguity outweighs sonority effects in stressed syllables, whereas the reverse is more often the case for word-final syllables.

Figure 3 illustrates the results for OST when place of articulation is controlled for. Again, only those productions truncated to one of the competing onsets are included, for example, WSW /mo'nako/ to ['mako] or ['nako] and SWW /'domina/ to ['doma] or ['dona]. Percentage selection (for types) of the noncontiguous versus contiguous onset is given for WSW and SWW nonsense words. Strikingly similar to the results on sonority, the contiguous competing onset is generally preserved in the WSW stimuli (/mo'nako/ is ['nako]), while the less marked onset for place more often takes priority over the contiguous onset in the SWW words (/'domina/ is ['doma]). So, contiguity mostly overrules place preferences for the stressed syllable, but vice versa for the word-final syllable.

5.2 Discussion and analysis of OST

In 5.1 it was established that contiguity of the stressed syllable is mostly maintained, irrespective of sonority or place of the competing onsets. Conversely, contiguity is more readily disrupted in word-final unstressed prominent syllables for the sake of a less marked onset. This result reflects the important role of the stressed syllable in L1. That is, the more stressed a position is, the more resistant it is to modification. All in all, the results confirm the dominant role of contiguity in OST for stressed syllables, and to a lesser degree for word-final syllables.

For an analysis of the results, I assume that contiguity can be relativized to different prosodic levels (Lamontagne 1996, cf. Pater 1997). Not only can contiguity relate to the level of segmental roots (I-CONTIG, see Section 2), but crucially also to the level of subsyllabic constituents (Onset-Rhyme), hierarchically one step above the segmental level (I-CONTIG-σ). Thus, this constraint ensures that an onset-rhyme sequence is adjacent in both the input and the output. Furthermore, a positionally conditioned constraint for contiguity of the *stressed* syllable is adopted.

(21) I-CONTIG-σ́: 'Input-Output *constituents* of a *stressed* syllable form a contiguous string'
I-CONTIG-σ: 'Input-Output *constituents* of a syllable form a contiguous string'

Constraints on, for instance, sonority can then intervene between the positional and general constraint. Data are in fact attested within the same child where onset-rhyme contiguity is maintained in the stressed syllable, but disrupted in the word-final syllable to meet sonority requirements. Charlotte at [1;8], for example, produces ['namo] for *di̲n̲ámo*, but ['pata] for *pát̲i̲n̲a*. The ranking in (22) successfully generates the attested forms (cover constraint SON is used for the ranking in (4)).

(22)

/di'namo/	I-CONTIG-σ́	SON	I-CONTIG-σ
damo	*!		*
☞ namo		*	
/'patina/	I-CONTIG-σ́	SON	I-CONTIG-σ
☞ pata			*
pana		*!	

6. A unified account of OST and OC-red

In Section 4 an analysis for OC-red was posited in which the surviving member of a cluster is determined by sonority or contiguity. In Section 5 it was established that sonority and contiguity play a key role in OST patterns. Apparently, underlying mechanisms are indeed the same for both processes, resolving the contiguity mismatch (recall contiguous OST: /b̲ə'l̲un/→[l̲un], but noncontiguous OC-red: /b̲lu/→[b̲u]). In this section a unified account is proposed for OST and OC-red.

In line with the earlier analysis of OST (Section 5.2), the contiguity mismatch is dealt with by appealing to prosodically relativized contiguity, having effect at the level of syllable constituents (Onset-Rhyme) and that of syllable segments, as expressed in (23).

(23) I-CONTIG-σ: 'Input-Output *constituents* of a syllable form a contiguous string'
I-CONTIG: 'Input-Output *segments* of a syllable form a contiguous string'

Noncontiguous OST violates constituent contiguity, as the onset-rhyme series is disturbed (/$b_1ə_2l_3u_4n_5$/→*[$b_1u_4n_5$], ✓[$l_3u_4n_5$]); non-sequential OC-red does not incur a violation at the constituent level (/bl_1u_2/→✓[b_1u_2], ✓[l_1u_2]), however it does at the segmental level (/$b_al_bu_c$/→*[b_au_c], ✓[l_bu_c]). With markedness constraints ranked between the specific and the general constraint a grammar exists where contiguity is respected across syllables, but not within, as in (24).

(24)

/bəˈlun/	I-CONTIG-σ	SON	I-CONTIG
bun	*!		*
☞ lun		*	
/bluː/	I-CONTIG-σ	SON	I-CONTIG
☞ buː			*
luː		*!	

With the faithfulness constraints on Contiguity interacting with Sonority constraints, factorial typology predicts a range of onset selection patterns. Data are attested for all grammars except one of the predicted child grammars so far (assuming WORDSIZE, *COMPLEX and *APP-L are undominated):

(25)

Ranking	*UR*	/bl/	/sl/	/bɑˈlɔn/	*Attested*
SON»I-CONTIG-σ, I-CONTIG	misr	[b]	[s]	[bɔn]	Charlotte
SON»I-CONTIG-σ, I-CONTIG	adult	[b]	[l]	[bɔn]	Amahl
I-CONTIG-σ»SON»I-CONTIG	misr	[b]	[s]	[lɔn]	×
I-CONTIG-σ»SON»I-CONTIG	adult	[b]	[l]	[lɔn]	Boris, Emma
I-CONTIG-σ, I-CONTIG»SON	misr/ad	[l]	[l]	[lɔn]	Hannah, Len

7. Conclusion

The current paper compares Onset Selection in Truncation and Onset Cluster reduction to gain insight into preservation strategies in L1. Based on the literature, contiguity effects are under-researched, if not doubted, whereby a unified account seems unfeasible. At the same stage a child may achieve faithfulness to contiguity for OST, but not for OC-red. New data were experimentally collected to ascertain this contiguity mismatch. Results confirm the role of contiguity in OST, particularly for the stressed syllable. Contrary to previous reports, results disprove the inactivity of contiguity in OC-red. Three out of seven children consistently retain the contiguous member of the cluster. I argue, therefore, that contiguity plays an active role in preserving onsets. With the interaction of Contiguity – which operates at different levels of representation – and Sonority, factorial typology predicts a range of onset selection patterns. Data are attested for the predicted child grammars. This account succeeds in both elucidating the contiguity mismatch in onset position, and explaining the optional stage of contiguous OC-reduction, a stage clearly taken too lightly so far.

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The Issue of Morphological Variation in Adult L2 French*

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1. Introduction

Recent research on the nature of interlanguage (IL) grammars has focused on the issue of variability in the production of inflectional morphology by second language (L2) learners, namely the fact that main verbs may be used in either a finite or nonfinite form. The question is whether morphological variability reflects some kind of grammatical deficit in underlying grammars. According to the Impairment Representation Hypothesis (IRH), it is indeed the case. Under a global view of impairment, Universal Grammar (UG) is not available to (adult) L2 learners (Meisel 1997). In particular, the fact that problems with morphology are persistent in L2 acquisition (even in advanced stages), in contrast to L1 acquisition, is taken as an indication that L2 acquisition is fundamentally different from L1 acquisition. If IL and L1 grammars are different in nature, then this suggests that functional categories, features, and feature-checking mechanisms are lacking in L2 systems (Prévost and White 2000b). According to a local view of impairment, only (finite) feature strength is impaired (Beck 1998; Eubank et al 1997). This means that verb placement is not related to feature checking. A verb, regardless of its form (finite or nonfinite), could appear in a finite position (e.g. above negation, or with a clitic or DP subject) or a nonfinite one (e.g. following a preposition, a negative adverb, or another verb). In short, inert finite features result in morphological variability.

In contrast to the IRH, some researchers have proposed that adult IL grammars are not impaired (Epstein et al 1996; Prévost and White 2000a,b; Schwartz and Sprouse 1996). Directly addressing the issue of variability, the Missing Surface Inflection Hypothesis (MSIH) holds that abstract properties may be present in the underlying grammar without being systematically realised morphologically (Haznedar and Schwartz 1997; Lardiere 2000; Prévost and White 2000a,b). More specifically, L2 learners may have problems accessing the relevant morphology or mapping morphology and syntax. According to this view, infinitival forms are used as default finite forms, which means that verbs that look nonfinite on the surface may occur in finite positions. Under the Truncation Hypothesis (TH), the production of nonfinite forms instead of finite verbs is structurally determined (Prévost and White 2000a). It is held that the root of declarative clauses may vary: it can be CP, IP, or VP (see Rizzi 1993/1994). On this view, a root infinitive (RI), namely a root declarative whose main verb is either an infinitival form or a past

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participle, is a VP-clause, which means that RI verbs are truly nonfinite. Both the MSIH and the TH adopt the idea that morphology and syntax may develop independently, i.e. it is not the case that problems with inflectional morphology reflect the lack of acquisition of underlying categories and features.

Results reported in research on morphological variability in the early stages of L2 French acquisition by adult learners support the MSIH (Herschensohn 2001; Prévost 2003a; Prévost and White 2000a,b). However, most data investigated so far come from longitudinal studies and are based only on a few learners, which makes it difficult to evaluate the scope of their conclusions. For instance, Prévost (2003a) reports that for one of the 4 adult learners he investigated over a one-year period, the incidence of finite forms in nonfinite positions is quite high in most interviews (around 20%). In contrast, the ratio is below 10% for the other learners. However, it is hard to tell whether this represents an isolated case or not. In this paper, I further investigate morphological variability in cross-sectional production data from English native speakers learning French in Quebec City. I examine some of the predictions made by the hypotheses sketched above pertaining to the types of verbs (tensed or not) that are expected to appear in finite and nonfinite positions.

2. The data

The data were gathered from 21 English-speaking learners of French enrolled at Laval University Language School. The participants were placed into 4 groups based on their proficiency level (from beginner to high intermediate) which was established via a local placement test (see Table 1). The learners received 4 hours of daily instruction on (and in) French, including formal instruction on grammar.

	G1 (n=5)	G2 (n=5)	G3 (n=6)	G4 (n=5)
Level	Beginners	Interm 1	Interm 2	Interm 3
Age	29.6 (18-41)	27 (19-39)	31.8 (20-54)	28.2 (21-37)
Time since test	1.7 months	1.4 months	1.7 months	2.8 months

Table 1: Learners and interview details

Recording sessions all followed the same format, including spontaneous production, role playing, story telling, etc. Each learner was recorded for at least one hour. For the analysis of the data, I followed the methodology adopted by Prévost and White (2000a,b). In particular, an infinitival verb was considered to be nonfinite unless evidence of the contrary, namely verbs ending in [e], which is ambiguous between the infinitival marker *-er*, the past participle marker *-é* and the 2nd person plural ending *-ez*, were categorised as nonfinite if they did not appear with the 2nd person plural pronoun *vous* 'you'. Moreover, formulaic speech was disregarded (e.g. *je sais pas* 'I don't know', *c'est XP* 'this is XP', *il y a XP* 'there is XP'), as well as repetitions from the interviewer.

3. Results

3.1 Finite and nonfinite root declaratives

As indicated in Table 2, all participants used both finite and nonfinite verbs in root declaratives. Yet, the production of nonfinite forms varies greatly across the learners. For some, the incidence of RIs is relatively high, whereas for others, it is quite low. Table 2 reports the production of root declaratives for every learner, distinguishing between the incidence of lexical verbs, the copula, auxiliaries, and modals. In bold, I isolate the learners for whom the incidence of RIs is quite high compared to other group members. Since all RIs but one involve a lexical verb, I further distinguish the incidence of RIs compared to all verbs and that of RIs compared to all lexical verbs. In general, we can observe a gradual decline in the incidence of RIs across the groups. This said, nonfinite root declaratives are found at every proficiency level, as illustrated in (1).

	Finite Declaratives				RIs		%RIs	
	Lex	Cop.	Aux.	Mod.	+Lex	-Lex	/Total	/Lex vbs
G1: Ann	39	15	12	0	25	0	**27.5%**	**39.1%**
Morgan	34	5	2	3	5	0	**11.4%**	**12.8%**
George	19	14	12	0	5	1	**11.8%**	**20.8%**
Edward	62	30	3	0	3	0	3.1%	4.6%
Mark	56	18	1	3	2	0	2.5%	3.4%
G2: Mike	26	25	7	4	30	0	**32.6%**	**53.6%**
Sophie	86	39	42	22	17	0	**8.3%**	**16.5%**
Jen	58	7	5	5	6	0	**7.4%**	**9.4%**
Sue	87	24	18	15	7	0	4.6%	7.5%
Rod	112	42	43	23	3	0	1.3%	2.6%
G3: Denise	69	23	20	22	25	0	**15.7%**	**26.6%**
Rose	84	53	32	36	11	0	5.1%	**11.6%**
Jill	109	45	85	32	14	0	4.9%	**11.4%**
Nicole	86	49	15	16	5	0	2.9%	5.5%
Kate	102	33	23	22	3	0	1.6%	2.9%
Rebecca	67	25	36	11	1	0	0.7%	1.5%
G4: Dorothy	98	28	32	13	17	0	**9.1%**	**14.8%**
Sandra	59	20	22	16	11	0	**7.4%**	**15.7%**
John	95	46	50	26	3	0	1.4%	3.1%
Deborah	136	44	63	48	1	0	0.3%	0.7%
Martine	111	31	26	8	0	0	0.0%	0.0%

Table 2: Finite and nonfinite root declaratives used by the learners

(1) a. Il boire. (Edward, G1)
he drink.INF

b. Il se réveiller à 7 heures. (Sue, G2)
he self wake+up.INF at 7 o'clock

c. Dans la nuit nous faire la cuisine. (Denise, G3)
in the night we do.INF the cooking

d. Il prendre des vêtements. (John, G4)
he take.INF some clothes

In addition, some verbs appear in both the finite and nonfinite form during the same interview. This is even true for the least proficient learners. Examples of such verbs are *travailler* 'work' in Ann (G1), *voyager* 'travel' in Morgan (G1), and *étudier* 'study' in George (G1). Some pairs of finite and nonfinite declaratives exhibiting the same verb are given in (2). This suggests that verbs do not systematically make their first appearance in one form or the other. Although some verbs only occur in RIs (as *faire* 'do' in Ann, *pratiquer* 'practice' in Morgan, and *chanter* 'sing' in George), others are found solely in the finite form, such as *jouer* 'play' (Ann), *apprendre* 'learn' (Morgan), and *manger* 'eat' (George).

(2) a. Et # cinq heures... <je n> [/] <je n> [//] je travaille pas.
and five o'clock I I I work.1/2/3S not
a' Une [=en?] october [= octobre] euh travailler euh commis. (Ann, G1)
one in october work.INF clerk
b. Ah je voyager <à> [/] à des États <U> [//] Unis.
I travel.INF to to some United States
b'. Uh uh je voyage uh Canada. (Morgan, G1)
I travel.1/2/3S Canada

3.2 Impairment or not?
3.2.1 Negation

If IL grammars are impaired, there should be no contingency between verb type and verb placement with respect to negation: finite and nonfinite forms should appear either above or below negation. If, in contrast, underlying systems are UG-compatible, finite verbs should not be found below negation. Table 3 shows that there are only 4 negative RIs in the data (in (3)), so it is impossible to draw any conclusion from them. As for finite negatives, the vast majority display V-Neg. Out of a total of 171 finite negative roots with a lexical verb, only 7 exhibit the reverse order (4.1%). When taking all negative declaratives into account (with either a finite or a nonfinite lexical verb), 167 out of 175 (95.4%) display V-Neg. Hence, the data on negation strongly show that the learners apply verb-movement rather systematically in L2 French, which suggests that the strength of the target finite feature has been acquired. As such, the data are evidence against the IRH, according to which a higher degree of variability should be expected (since finite features are held to be at least inert in IL grammars). Interestingly enough, this finding holds for all groups of learners, including the least proficient ones.

(3) a. Je ne expliquer pas. (Mark, G1)
I NEG explain.ING not
b. Il ne respirer pas. (Sue, G2)
he NEG breathe.INF not

c. Il ne pas essayer (Sue, G2)
he NEG not try.ING
d. Je ne connaisser pas. (Dorothy, G4)
I NEG know.INF not

	Finite declaratives						RIs		
	V-Neg		Neg-V		ne-V		V-Neg	Neg-V	ne-V
	+lex	-lex	+lex	-lex	+lex	-lex	+lex	+lex	+lex
G1: Ann	4	0	0	0	0	0	0	0	0
Morgan	3	0	1	0	0	0	0	0	0
George	4	0	0	0	0	0	0	0	0
Edward	1	1	0	0	0	0	0	0	0
Mark	8	0	0	0	0	0	1	0	0
G2: Mike	3	0	0	0	0	0	0	0	0
Sophie	10	6	1	0	0	1	0	0	0
Jen	11	0	1	0	0	0	0	0	0
Sue	11	6	0	0	0	0	1	1	0
Rod	8	9	0	0	0	0	0	0	0
G3: Denise	4	7	1	0	0	0	0	0	0
Rose	8	6	0	0	0	0	0	0	0
Jill	7	12	2	0	1	1	0	0	0
Nicole	16	9	0	0	0	0	0	0	0
Kate	12	9	0	0	0	0	0	0	0
Rebecca	11	2	0	0	0	0	0	0	0
G4: Dorothy	7	2	1	0	0	0	1	0	1
Sandra	6	3	0	0	0	0	0	0	0
John	5	10	0	0	0	0	0	0	0
Deborah	15	26	0	0	0	0	0	0	0
Martine	10	6	0	0	0	0	0	0	0

Table 3: Verb-placement with respect to negation in root declaratives

3.2.2 Agreement

If features and feature checking mechanisms are absent from IL grammars, as contended by the global view of impairment, L2 learners are expected to produce non-matching (or faulty) agreement. Non-impairment views of IL systems do not predict such mismatches. Since inflectional morphology is highly homophonous in French, I only looked at suppletive morphology (such *je suis* 'I am') and distinctive regular endings such as 1st person plural *-ons*, 2nd and 3rd person plural inflection on 2nd group verbs (i.e. forms such as *finissez* 'finish.2P' and *finissent* 'finish.3P') and on 3rd group verbs (i.e. forms like *sortez* 'leave.2P' and *sortent* 'leave.3P'). As can be seen in Table 4, there are very few agreement mismatches in the recordings, even in the data from Group 1. Errors account for less than 10% of the data for each participant, except for Sophie (22.2%). Most errors involve the use of the 3rd person singular form, as shown in (4). This is akin to the results reported by Prévost and White (2000b) on adult learners of L2 French and L2 German whose L1 is not English. In short, the problem with inflectional morphology is not one of faulty inflection, contrary to what an impairment view of IL grammars would predict. The

IRH would also have difficulties explaining why the few errors that are observed systematically involve the use of default (3rd person singular) forms.

(4) a. Mes amis a (=ont) québécois... (Morgan, G1)
my.PL friend.PL has quebecer
b. Beaucoup de personnes veut pratiquer ... (Sophie, G2)
a+lot of people want.1/2/3S practice.INF
c. Ils sort (=sortent) ensemble. (Martine, G4)
they leave.1/2/3S together

	Correct	Incorrect	% Incorrect
G1: Ann	10	1	9.1%
Morgan	15	1	6.25%
George	7	0	0.0%
Edward	10	1	9.1%
Mark	13	1	7.1%
G2: Mike	13	1	7.1%
Sophie	42	12	22.2%
Jen	20	1	4.8%
Sue	27	2	6.9%
Rod	64	1	1.5%
G3: Denise	31	3	8.8%
Rose	88	1	1.1%
Jill	53	2	3.6%
Nicole	33	2	5.7%
Kate	40	3	7.0%
Rebecca	37	1	2.6%
G4: Dorothy	70	3	4.1%
Sandra	33	2	5.7%
John	60	2	3.2%
Deborah	80	3	3.6%
Martine	49	4	7.5%

Table 4: Correct and incorrect verbal agreement

3.2.3 Verbal forms in nonfinite positions

If learners have knowledge of finiteness, finite forms should not occur in nonfinite positions. If, on the contrary, IL grammars are impaired, this kind of mismatch is to be expected. The results are given in Table 5. As can be seen, there is a high incidence of finite forms in nonfinite positions for G1, followed by a sharp decline. In total, 48% of verb forms in nonfinite positions are finite for G1, compared to only 8.3% for G2. Moreover, the incidence of finite forms in nonfinite positions is above 10% for all G1 learners. In contrast, there are two learners in that situation in G2 (Jen and Sophie), one in G3 (Jill), and none in G4. The results of G1 and G2 go in the same direction as what Prévost (2003a) reported on one of the learners (Jane) he investigated (recall section 1), which suggests that this learner was not an isolated case. Examples of nonfinite and finite forms in nonfinite contexts are given in (5) and (6) respectively.

(5) a. J'ai étudié heu secondaire. (Ann, G1)
I have.1S studied secondary
b. Elle est boire du thé. (George, G1)
she is drink.INF some tea
c. Je veux voyager un peu. (Mark, G1)
I want.1/2/3S travel.INF a little
d. Il est prépare pour dormer. (George, G1)
he is prepare.1/2/3S to sleep.INF

(6) a. J'ai difficile demande des questions. (Ann, G1)
I have.1S difficult ask.1/2/3S some questions
b. Il est prépare pour dormer. (George, G1)
he is prepare.1/2/3S for sleep.INF
c. Comment tu vas arrive à mon travail? (Jen, G2)
how you go.1/2/3S arrive.1/2/3S to my work
d. ...qui uh j'ai rencontre à Nouvelle-Écosse (Jill, G3)
who I have+1S meet.1/2/3S in Nova-Scotia
e. .. mais je ne peux pas parle ... (Sophie, G2)
but I NEG can+1/2/3S not speak.1/2/3S

	Prep+V	Aux+V	Mod+V	V+V	Neg+V	+Fin / Total	
G1: Ann	1/2	6/12	--	0/2	--	7/16	(43.7%)
Morgan	0/1	0/2	3/4	--	1/1	4/8	(50%)
George	2/5	8/12	--	--	--	10/17	(58.8%)
Edward	--	3/3	--	--	--	3/3	(100%)
Mark	--	0/2	1/6	--	--	1/8	(12.5%)
G2: Mike	0/10	2/8	0/6	0/2	--	2/26	(7.7%)
Sophie	2/15	9/54	3/28	--	1/6	15/103	(14.6%)
Jen	0/4	2/6	4/12	--	1/1	7/23	(30.4%)
Sue	0/10	1/25	0/15	1/2	0/6	2/58	(3.4%)
Rod	1/19	2/69	0/38	0/5	0/7	3/138	(2.2%)
G3: Denise	0/13	1/26	2/27	0/3	1/4	4/73	(5.5%)
Rose	0/27	1/46	0/46	0/1	0/2	1/122	(0.8%)
Jill	13/51	13/106	7/49	1/4	2/14	36/224	(16.1%)
Nicole	1/15	1/26	0/29	0/7	0/2	2/79	(2.5%)
Kate	0/16	0/31	2/32	0/2	0/8	2/89	(2.2%)
Rebecca	0/22	0/50	0/20	0/1	0/2	0/95	(0%)
G4: Dorothy	3/51	2/42	0/20	0/4	1/3	6/120	(5%)
Sandra	0/14	1/31	1/28	0/1	0/4	2/78	(2.6%)
John	0/11	0/73	3/35	1/1	0/6	4/126	(3.2%)
Deborah	0/76	0/99	0/64	1/9	0/14	1/262	(0.4%)
Martine	0/32	0/36	0/15	0/6	0/2	0/91	(0%)

Table 5: Finite forms in nonfinite positions

The high incidence of finite forms in nonfinite contexts in some of the learners is not expected by the non-impairment approaches presented in section 1. However, it does not strongly support impairment either, be it global or local. In particular, it

is not found in all learners. Yet, according to the global view of impairment, impairment is permanent. Therefore, if impairment is the explanation for the G1 data, then it is difficult to understand why a similar incidence of finite forms in nonfinite positions is not found in more proficient learners. Moreover, the impairment account predicts overuse of finite forms across learning contexts, contrary to facts. In particular, Prévost and White (2000b) report that the ratio of finite forms in nonfinite positions is below 10% for Moroccan Arabic learners of French and for Spanish and Portuguese learners of German. Importantly, these learners were at the beginner level when data collection began, as is the case here.

It is also important to point out that no finite form occurring in nonfinite contexts displays an overt ending, such as 1st person plural *-ons*, or a suppletive form. For instance, there is no occurrence of something like *pour partons* 'for leave.1P' or *pour est* 'for be+3S' in the data. Consequently, it could be the case that the (superficially) finite forms occurring in nonfinite positions are in fact bare forms. In particular, it is quite possible that less proficient learners associate the lack of overt infinitival marker in English to the infinitive in French. This indeed seems to be the case with verbs such as *préparer* 'prepare' and *arriver* 'arrive', as in (6b-c), which are similar to their French counterparts. In other words, bare forms of this type could be default nonfinite forms. When data from learners whose L1 displays overt infinitival endings, like German, are taken into account, such results do not obtain, namely "bare forms" do not occur in nonfinite positions. It is as if the presence of overt morphology in the L1 (or the lack thereof) played a role in the provision of corresponding inflection in the L2 (see also White 2003b).

3.3 Missing surface inflection or truncation?

So far, the data suggest that the learners' IL grammars are unimpaired. Let us now see whether they support the TH or the MSIH. For this, we focus on the incidence of subjects in root declaratives and the interpretation of these utterances.

3.3.1 Subjects

Under the TH, nonfinite verbs should not be found with DP and clitic subjects since these elements entail the projection of IP. The only overt subjects that could occur in RIs are strong pronouns such as *moi* 'me' which bear default case in French. In contrast, the MSIH predicts that (superficially) nonfinite verbs can appear with any subject (except for strong pronouns) since they are considered to be finite. In the analysis of the data, I disregarded the incidence of pronouns such as *elle* 'she', *nous* 'we' and *vous* 'you+PL', which are ambiguous between clitics and strong pronouns in French. As can be seen in Table 6, there is no significant contingency between clitic subjects and verb forms for any of the learners who produced RIs, except for Ann (X^2=5.116, p<.05) and Rose (X^2=9.975, p<.01). Indeed, the ratio of subject clitics employed in RIs is at least 50% for 9 of the learners (see examples in (7)). Similar patterns are found in learners who did not use RIs productively. These results go in the direction of the MSIH.

(7) a. Je parler avec administration. (Ann, G1)
I speak.INF with administration
b. Ils visiter moi. (Mike, G2)
they visit.INF me
c. On aller au centre d'achats. (Jill, G3)
we go.INF to+the mall
d. Il retourner à la maison. (Sandra, G4)
he return.INF to the house

Note that clitic subjetcs seem to be known early on by the learners: they are found in all recordings and they rarely appear in non-clitic positions, such as following a preposition, or in coordination contexts. Furthermore, extra material (e.g. adverbs) rarely appear between the pronominal subject and the verb, and clitics never occur alone as an answer to a question; in the latter case, a strong pronoun is used instead.

	Subject clitics		DPs	
	+Fin	-Fin	+Fin	-Fin
G1: Ann	29/63 (46%)	5/25 (20%)	2/66 (3%)	0/25
Morgan	38/41 (92.7%)	4/5 (80%)	1/44 (2.3%)	0/5
George	29/39 (74.4%)	3/5 (60%)	4/45 (8.9%)	0/5
G2: Mike	32/49 (65.3%)	17/30 (56.7%)	9/62 (14.2%)	3/30 (10%)
Sophie	143/158 (90.5%)	14/17 (82.4%)	15/189 (7.9%)	0/17
Jen	49/63 (77.8%)	3/6 (50%)	11/75 (14.7%)	3/6 (50%)
G3: Denise	79/105 (75.2%)	17/25 (68%)	10/134 (7.5%)	1/25 (4.0%)
Rose	109/150 (72.7%)	3/11 (27.3%)	31/205 (15.1%)	5/11 (45.4%)
Jill	208/244 (85.2%)	14/14 (100%)	24/271 (8.9%)	0/14
G4: Dorothy	83/133 (62.4%)	9/17 (52.9%)	33/171 (19.3%)	1/17 (5.9%)
Sandra	98/110 (89.1%)	9/11 (81.8%)	8/117 (6.8%)	0/11

Table 6: Subjects of finite and nonfinite root declaratives

The incidence of DP subjects is quite low, both in finite declaratives and in RIs (Table 6). This said, for 4 of the learners for whom the incidence of DP subjects in finite roots is above 10% (Mike, Jen, Rose, and Dorothy), different results obtain when looking at their incidence in RIs. The incidence of DP subjects does not differ significantly in finite and nonfinite declaratives for Mike (X^2=.364, p>.05), it is significantly higher in RIs than in finite root declaratives for Jen (X^2=4.851, p<.05) and Rose (X^2=6.916, p<.01), whereas the opposite is observed for Dorothy. For 3 other learners who exhibit a low production rate of RIs, Sue (G2), Nicole and Kate (G3), at least 25% of the DPs they used appear in nonfinite declaratives. In short, the incidence of infinitival verbs appearing with a finite subject is relatively high in the data, which argues against the truncation approach.

Finally, only 2 strong pronoun subjects appear in the corpus. This suggests that main verbs, regardless of their forms, are finite in the adult data. It also shows that the learners have knowledge of Case marking in L2 French: where nominative case is expected, nominative case is supplied. These results are consistent with findings in longitudinal data reported by Prévost (2003a).

3.3.2 Interpretation of root declaratives

Under the TH, there should be a contingency between finiteness and future/modal interpretation. Following Hyams (2001), I assume that verbs bearing an infinitival marker usually receive an [irrealis] interpretation. Since such forms are held to be nonfinite by the TH, there should be a high incidence of RIs with a future or modal reading. Under the MSIH, since nonfinite forms arise due to access or mapping problems, there should be no particular difference between (superficially) nonfinite forms and finite forms with respect to interpretation. Results show that there is almost no significant contingency between verbal form and future/modal reading. As shown in Table 7, for 5 of the learners who produced RIs, the future/modal interpretation rate in such utterances is between 15% and 20% (see the examples in (8a-b)). For 3 of them, there is no significant difference with the corresponding ratio in finite root declaratives (Ann: X^2=.042, p>.05; Mike: X^2=.299, p>.05; Denise: X^2=.609, p>.05). For the other two, George and Sandra, the rates are much higher in the case of RIs, but the actual figures prevent the calculation of chi-square statistics. This notwithstanding, the rate of RIs with a future or modal reading is quite low compared to the child data, which is above 60% (Prévost 2003b). In general, adult root declaratives refer to present/past events, as illustrated in (8c-d). These results are once again compatible with the MSIH and with the findings in longitudinal studies.

	Finite decl.	%Fut/Mod	RIs	%Fut/Mod
G1: Ann	7/39	17.9%	5/25	20%
Morgan	1/34	2.9%	0/5	0%
George	1/19	5.3%	1/5	20%
G2: Mike	3/26	11.5%	5/30	16.7%
Sophie	0/58	0%	0/6	0%
Jen	1/86	1.2%	0/17	0%
G3: Denise	7/69	10.1%	4/25	16%
Rose	1/84	1.2%	0/11	0%
Jill	3/109	2.7%	0/14	0%
G4: Dorothy	0/98	0%	1/17	5.9%
Sandra	0/59	0%	2/11	18.2%

Table 7: Future/modal interpretation of root declaratives

(8) a. Ils visiter moi prochain été. (Mike, G2)
they visit.INF me next summer

b. Je me costumer comme une servante. (Sandra, G4)
I myself disguise.INF like a servant
[S. is talking about activities to come]

c. (Elle) chanter pour (=par) microphone. (George, G1)
she sing.INF by microphone
[G. is describing a picture]

d. J'apprendre français. (Mike, G2)
I learn.INF French
[M. is talking about what he did after he arrived in town]

4. Discussion and conclusion

The results confirm the predictions of the MSIH. From the lowest proficiency levels on, nonfinite verbs are found along with clitic subjects - almost never with strong pronoun subjects - and they rarely receive an [irrealis] interpretation. In addition, there is knowledge of functional categories involved in finiteness, of features (as illustrated by knowledge of Case and agreement), and of feature strength (as illustrated by knowledge of verb-movement over negation). These results confirm findings in longitudinal studies on adult L2 French from English-speaking learners (Prévost 2003a) and on adult L2 French and L2 German from speakers of other languages (Prévost and White 2000a,b). In other words, there is a dichotomy between the categorial and featural contents of underlying grammars, and their (overt) morphological realisation. The results also support previous research suggesting a difference between child and adult RIs, such that child RIs are truly nonfinite whereas adult RIs have finite properties (Prévost and White 2000a).

The findings do not confirm the Impaired Representation Hypothesis. The fact that finite verbs are almost always placed to the left of negation cannot support either the global or local view of that approach. A similar conclusion is reached when looking at agreement (almost no case of mismatching is found) and when considering finite verbs appearing in nonfinite positions. As far as the latter results are concerned, not only is the incidence of finite verbs in nonfinite positions restricted to the G1 group, it was also shown not to occur in the production data of other learners whose native language is not English. The notion of global impairment can therefore not be maintained.

I order to explain morphological variability in adult L2 acquisition, I adopt Prévost and White's (2000b) account according to which infinitival forms may be underspecified for the [-finite] feature, which means that they can be inserted under nodes requiring [+finite] or [-finite] items. Moreover, suppletive forms, as well as overtly inflected verbs, are not underspecified for [+finite], which means that they cannot be found in nonfinite positions. This is indeed what was found in the present data. As for bare forms, typically 3rd person singular forms, I suggest that they are nonfinite for the learners, based on L1 influence, specifically the lack of overt infinitival markers in English. Therefore, bare forms are associated with [-finite] in the grammar, and then inserted into a nonfinite position. Alternatively, it could be that 3rd person singular forms, or bare forms, are underspecified for the [+finite] feature, which enables them to occur in [+finite] and [-finite] positions without triggering feature mismatching.

The results also suggest that L2 acquisition of syntax is independent from the acquisition of morphology, since inflectional morphology is not systematically supplied whereas syntactic phenomena such as verb-movement seem to have been acquired. This goes against the Rich Agreement Hypothesis (see White 2003a), according to which acquisition of superficial morphology triggers acquisition of functional categories, features or feature strength, as illustrated by proposals by Eubank (1993/1994) and Vainikka and Young-Scholten (1996).

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Markedness Hierarchies vs. Positional Faithfulness and the Role of Multiple Grammars in the Acquisition of Greek

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1. Introduction

Child language research investigates how language development proceeds. In pursuing this question, many researchers argued that markedness constraints are initially more prominent in the emerging grammar since they are active in early word segmentation tasks. Consequently, they must outrank faithfulness constraints at initial stages of language acquisition (Smith 1973; Demuth 1995; Levelt 1995; Goad 1997; Gnanadesikan to appear, among others). Inventories of entirely unmarked structures are expected to be more easily processed in production and/or comprehension but do not allow for the range of distinctions required for the expressiveness of adult language. The child's job is not to learn to imitate adult productions of a given stock of words but to learn the target grammar and, more specifically, to determine which compromises have been adopted in its target language. In order to account for the stage-like developmental progression found in the acquisition production data, Tesar and Smolensky (2000) assume acquisition to proceed by means of constraint demotion. That is, the child starts from a hierarchy where all *markedness* constraints dominate all *faithfulness* constraints and gradually, by demoting markedness constraints only as needed, it admits into its inventory those marked structures that are evidenced in the target adult language. More importantly, it is often the case that the learner, in going from the initial state of the grammar, $G_{initial}$, to the final state, G_{final}, passes through several intermediate grammars known as *learning paths* (cf. Levelt and Van de Vijver to appear).

This paper investigates intermediate stages of phonological development during which markedness is not as prominent as in earlier stages. Unlike other approaches that account for segmental selection in children's truncated outputs either in terms of structural restrictions such as the sonority hierarchy and the markedness scales (Barlow 1997; Barlow and Gierut 1999; Pater and Barlow 2003), or contiguity considerations (cf. Van der Pas this volume), the focus here is on positional faithfulness constraints. In particular, children's outputs that preserve perceptually salient positions, i.e. stressed and/or edgemost syllables, are shown to be quantitatively more prevalent in non-initial states of acquisition than segmentally unmarked outputs. In fact, the stressed syllable faithfulness grammar is argued to

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constitute the core grammar in this stage. In short, a central claim in this paper is that positional faithfulness emerges before general faithfulness and, more importantly, takes over markedness constraints in advanced states of acquisition.

In addition, this paper puts forward the claim that learning does not consist of a series of linearly ordered grammars, each one corresponding to a clearly defined developmental stage. Instead, it is proposed that acquisition proceeds through a system of multiple parallel co-grammars, which together give rise to a pool of variable output productions for a given input string. In this system, certain blocks of co-grammars are associated with certain developmental phases. More precisely, next to the stressed syllable faithfulness core grammar, it is shown that children employ several parallel co-grammars, that is, different hierarchies of markedness and faithfulness constraints where usually specific types of positional faithfulness constraints are top-ranked. We focus on a co-grammar that promotes the faithful production of word initial consonants in children's outputs (the initial consonant faithfulness co-grammar). Parallel co-grammars are not quantitatively as robust as core grammars but constitute a statistically significant part of the overall production data. The existence of multiple parallel co-grammars is considered to be vital for the enrichment of the child's production repertoire with variable output forms and hence for the maturation of its phonological system.

Moreover, the effects of markedness constraints fade away as acquisition progresses without, however, been completely annulled (cf. Pater 1998 for the issue of minimal violation of constraints). Certain markedness principles such as the sonority hierarchy are reported to exercise influence on the featural composition of the produced stressed syllable or the preserved initial consonant of the target form. The lingering effects of the sonority hierarchy and the markedness scales intimate the existence of what we call here 'hybrid co-grammars'. These are constraint hierarchies where, in contrast with the markedness grammars of initial states, a subset of markedness constraints dominates (positional) faithfulness. It is shown that only a small fragment of children's productions is liable to sonority effects. Hybrid co-grammars are of pivotal importance because, first, they provide empirical support for gradual markedness demotion and, second, they form natural linking paths between the markedness grammars of initial states and the (positional) faithfulness grammars of advanced ones.

The above assumptions are based on the study of naturalistic data drawn from the Greek child language database developed at the University of Leiden Center for Linguistics. In particular, we examine data from three boys and two girls with an age range of 1;07 to 3;06.

The remaining of this paper is organized as follows: section 2 examines children's productions that faithfully preserve the segmental composition of the stressed syllable in target forms and comprise the statistically prevalent positional faithfulness core grammar in advanced development. Hybrid grammars that connect the core grammar with previous developmental states are also discussed in this section. Section 3 presents data that display faithfulness to the initial segment of target forms regardless of markedness considerations and hence embody the parallel co-grammar of the examined stage. Section 4 summarizes and concludes this paper.

2. The core grammar and the hybrid co-grammars in child speech

Research on the acquisition of segmental structure concentrates primarily on the realization of consonant clusters in child speech. It has been argued that children's early productions preserve the stressed and/or rightmost syllables of the adult words (Echols and Newport 1992). Pater (1998) reports that in many truncated forms the consonant of a preceding non-produced syllable is chosen as an onset provided it is less sonorous than the onset of the final/stressed syllable. Many researchers (Fikkert 1994; Barlow 1997; Barlow and Gierut 1999; Ohala 1999; Pater and Barlow 2003; Tzakosta 1999, 2001; Kappa 2003; Gnanadesikan to appear, among others) concur that children tend to produce the member of the consonant cluster that best satisfies the sonority hierarchy and the markedness scales (de Lacy 2002).[1] That is, the less sonorous a consonant is, the more likely it is to surface in the children's outputs. For instance, in a stop+liquid cluster, the less sonorous stop has more chances to surface.

It has been reported, however, that in stop+stop clusters with the same manner of articulation in English, children tend to drop the initial consonant regardless of place of articulation (Smith 1973). Following this line of investigation, Van der Pas (this volume) maintains that contiguity is a controlling factor in the shaping of child Dutch truncated forms. That is, the segment closer to the nucleus may be selected even if it is more marked compared to the deleted segment. Although this pattern is attested in English and Spanish child speech, in Greek, it is reported to be rare.

Goad and Rose (to appear) take a different position on the issue of children's truncated outputs. On the basis of reduction patterns for left-edge clusters observed in the acquisition of West Germanic languages, they distinguish between the sonority and the head pattern of reduction. In the former, the less sonorous consonant is retained in output forms, e.g. /Sl/ → [S]. In the latter, the sonorant survives e.g. /Sl/ → [l], because it is the head of the onset in the target form. They take both patterns of cluster reduction to be representative of distinct stages in development that differ in the degree to which inputs are elaborated. The head pattern, characteristic of an advanced stage, presupposes highly structured target-like inputs. The sonority pattern, on the other hand, arises from less articulated inputs where there is no knowledge of the structural relations that hold across strings of consonants; hence, the head of the onset is defined in terms of relative prominence.

In this paper we present evidence that children's productions in Greek child speech faithfully preserve the segmental composition of the stressed syllable. More specifically, in section 2.1 we show that the stressed syllable faithfulness pattern (σ́-faithfulness) is predominant and constitutes the core grammar of intermediate states in development. In section 2.2, we examine a set of facts that establish the existence of linking paths (hybrid co-grammars), which connect the σ́-faithfulness grammar with grammars of earlier states of acquisition. Alternatively, however, children produce outputs where the initial consonant of the target form is realized as the onset of the stressed nucleus. The initial consonant faithfulness pattern, although it is

[1] Coronals have been claimed to be cross-linguistically less marked than labials and dorsals (*DORS, * LAB >> *COR). Similarly, fricatives and voiced consonants are regarded as less marked than stops and voiceless consonants, respectively, hence the constraints *FRIC, *VOI.

statistically significant, is not prevalent enough to qualify as a core grammar. This will be discussed at length in section 3.

2.1 The core grammar: stressed syllable faithfulness

Let us have a close look at some examples of the σ́-faithfulness pattern, which is typical for monosyllabic as well as disyllabic productions. Monosyllabic truncations are predominant during the so-called subminimal word stage, while disyllabic templates are more frequent during the minimal, usually trochaic, word stage. However, it is hard to accurately define the beginning and ending points of stages in Greek child language. For instance, monosyllabic truncations are not restricted to the subminimal word stage since they often expand to late language development. Our subject F's production data are quite representative in this respect (see Tzakosta in prep. for detailed discussion of this issue). Moreover, as we will argue in the following sections, acquisition is not a linear process but proceeds through a complex network of parallel grammatical systems. This entails that certain blocks of parallel co-grammars are associated with certain developmental stages. For this reason, we refrain from defining concrete stages in this study.

In all examples, children fully realize the prosodic head of the target word, i.e. the stressed syllable, irrespective of whether its onset is structurally simple, as in (1a-e) and (1g), or complex, as in (1f). Evidently, sonority considerations are inert in segmental selection. In (1a) and (1b), the voiced dorsal fricative /ɣ/ and the voiced labial sonorant /m/, respectively, are realized at the expense of the relatively unmarked voiceless coronal stop /t/ in the neighboring unstressed syllable. Similarly, in (1g), the voiceless dorsal /k/ wins out over the coronal sonorant /n/.

(1) *monosyllabic truncations*

a	/ˈɣa.ta/	[ˈɣa]	'cat'	B2: 1;10
b	/ˈmi.ti/	[ˈmi]	'nose'	B2: 1;11.15
c	/ˈva.lo/	[ˈva]	'put-1sg'	M: 1;08.31
d	/kli.ˈði/	[ˈði]	'key'	D: 2;02
e	/sci.ˈla.ci/	[ˈla]	'dog-DIM'	F: 2;0.04
f	/ˈvle.po/	[ˈvle]	'see-1sg'	F: 2;05.09
g	/ˈko.ci.no/	[ˈko]	'red'	F: 2;09.05

The same holds for disyllabic truncations, as shown in (2). Polysyllabic words are truncated to disyllabic ones from the age of 1;10 (cf. B1) up to the age of 2;08.15 (cf. F). Regardless of the size of output words, the examples in (2) evidence once again that children are faithful to the stressed syllable and its segmental content. It is the head of the prominent foot that the child produces faithfully, even if this entails that a dorsal /k/ is chosen over the more unmarked coronal /t/, as in (2a), or that the sonorant /r/ is favored over the voiceless stop /k/, as in (2f).

(2) *disyllabic truncations*

a	/por.to.ˈka.li/	[ˈka.li]	'orange'	B1: 1;10
b	/me.ˈɣa.lo/	[ˈɣa.lo]	'big'	B1: 1;11.09
c	/tra.ˈɣu.ðja/	[ˈɣu.ja]	'song-pl'	B2: 1;11.15

d	/ka.ˈpe.lo/	[ˈpe.loː]	'hat'	M: 2;0.06
e	/ʧe.li.ˈðo.ni/	[ˈðo.ni]	'swallow'	F: 2;08.15
f	/ka.ˈra.vi/	[ˈra.vi]	'ship'	D: 2;01.23

To account for the above facts we must rely on the notion of prosodic headedness. It is well-established that phonological heads show the maximum complexity allowed by the grammar. If there is an asymmetry, the head will be more complex than the dependent. For instance, heads of feet are often heavier (i.e. bi-moraic) than their dependents. Similarly, certain phonemic contrasts are tolerated only in prosodic heads such as stressed syllables, and so on (cf. Dresher and Van der Hulst 1998). The saliency of prosodic heads led researchers to propose head-specific faithfulness constraints such as HEADFAITH,[2] stated in (3):

(3) HEADFAITH: Preserve the segmental and the featural composition of an input prosodic head in the output.

Ranked above the sonority and the markedness scales constraints, as shown in (4), HEADFAITH guarantees that the stressed syllable will be pronounced and, moreover, its segmental content will be faithfully realized in the child's output. Consequently, all markedness constraints referring to voicing, manner and place of articulation are irrelevant to the selection of the optimal candidate. It should be pointed out that independent markedness constraints determine the monosyllabic and di-/trisyllabic template size of the outputs (see Tzakosta in prep. for details). The following tableaux spell out the details of the competition that leads to the surfacing of the outputs listed in (1) and (2):

(4) HEADFAITH >> *VOI, *FRIC, {*DORS, *LAB >> *COR}, FAITH

T1 /ˈɣa.ta/	HEADFAITH	*VOI	*FRIC	*DORS	*LAB	*COR
a [ˈta]	*!					*
☞ b [ˈɣa]		*	*	*		
c [ˈka]	*!			*		

T2 /ʧe.li.ˈðo.ni/	HEADFAITH	*VOI	*FRIC	*DORS	*LAB	*COR
☞ a [ˈðo.ni]		*	*			*
b [ˈdo.ni]	*!	*				*
c [ˈto.ni]	*!					*

The grammar in (4) qualifies as the *core grammar* because, besides being cross-linguistically productive, it is quantitatively prevalent in the speech of all children of our study during all states of intermediate development.

[2] The constraint comprises both HEAD-MAX, which requires input segments of a prosodic head to be preserved in the output, and HEAD-IDENT[F], which requires correspondent segments contained in a prosodic head to be identical for F. Thus, HEADFAITH is violated when, for instance, an input prosodic head such as /ˈɣa/ surfaces as [ˈka] or [ˈa].

2.2 Hybrid co-grammars: sonority effects on stressed syllable faithfulness

The sonority hierarchy and the markedness scales have often been found to exercise a partial influence on children's outputs. This is evidenced by production data such as the ones in (5) and (6). More specifically, the segmental composition of the targeted stressed syllable is often changed towards unmarked values. For instance, in (5a-c) fricatives are realized as stops, suggesting that the marked [+cont] value of the manner of articulation changes to the less marked [-cont]. In (5c), in particular, the coronal stop is chosen over the labial fricative. It is evident that such outputs arise from a ranking where *FRIC dominates HEADFAITH. Moreover, in (5d-e) the voicing value of the onset of the stressed syllable is altered towards the unmarked value, namely [-voice], thus suggesting that *VOI occupies a high rank in the hierarchy.

(5) *monosyllabic truncations*

a	/'va.lo/	['ba]	'put on-1sg'	B (2): 1;10
b	/kra.'si/	['ti]	'wine'	D: 2;03.14
c	/le.'fta/	['ta]	'money'	F: 2;01.11
d	/'ble/	['ple]	'blue'	B2: 1;11.14
e	/'va.tra.xos/	['fax]	'frog'	F: 2;05.09

Similar shifts to the unmarked value are exhibited by disyllabic truncations, as shown in (6). The combined effects of *VOI and *FRIC can be seen in the form *pe.ða.ca* (6c) where the voiced fricative surfaces as a voiceless stop, ['ta.ca].

(6) *disyllabic truncations*

a	/e.kli.'su.la/	['tu.la]	'church-DIM'	Me: 1;07.05
	/ka.'re.kla/	['te.ca]	'chair'	F: 1;11.21
	/ka.la.'θa.ci/	['ta.ci]	'basket-DIM'	Me: 2;03.01
b	/ka.ra.'me.la/	['pe.la]	'sweet'	F: 1;11.28
	/tre.'na.ci/	['ta.ci]	'train-DIM'	B2: 1;11.28
c	/pe.'ða.ca/	['ta.ca]	'children-DIM.pl'	M: 2;02.24

The rankings in (7) formalize the described system of affairs. The selection of the optimal candidates is illustrated in tableaux 3 and 4, respectively. In all these rankings, only a subset of markedness constraints outranks HEADFAITH, thus giving rise to partially unmarked outputs.

(7) *sonority effects on the ó-faithfulness core grammar*

a *FRIC >> HEADFAITH >> *VOI, {*DORS, *LAB >> *COR}: (5a-c), (6a)
b *VOI >> HEADFAITH >> *FRIC, {*DORS, *LAB >> *COR}: (5d-e), (6b)
c *VOI, *FRIC >> HEADFAITH >> {*DORS, *LAB >> *COR}: (6c)

T3 /'va.lo/	*FRIC	HEADFAITH	*VOI	*DORS	*LAB	*COR
a ['va]	*!		*		*	
☞ b ['ba]		*	*		*	

T4 /pe.ˈða.ca/	*VOI	*FRIC	HEADFAITH	*DORS	*LAB	*COR
a ['da.ca]	*!		*			*
b ['θa.ca]		*!	*			*
☞ c ['taca]			*			*

A fundamental premise of Optimality Theory (Prince and Smolensky 1993) is that different constraint rankings correspond to different grammars. Consequently, the rankings in (7) represent several parallel co-grammars[3] in Greek child speech. The co-grammars are distinct strata of constraints that are enforced in parallel with each other and with the core grammar. The co-grammars in (7), in particular, reflect the minimal effects of markedness on the faithfulness-based core grammar and, in a sense, are relics of earlier stages of acquisition where markedness constraints were dominant. This point is further elucidated if we take into consideration the following examples:

(8) *markedness core grammar: cor > dors, lab*

a	ka.ˈse.ta	['te.ta]	'tape'	D: 2;1
b	pi.ˈsto.li	[te.ˈto.li]	'pistol'	D: 2;1
c	pe.ˈða.ca	['ta.ta]	'child-DIM.pl'	D: 2;2

The examples in (8) are produced by D during initial stages of acquisition and reflect the effects of a markedness grammar. Outputs with voiceless coronals are favored over faithfulness productions of the adult forms. We infer, therefore, that at this developmental state sonority and markedness scales must outrank faithfulness to the prosodic head: *VOI, *FRIC, {*DORS, *LAB >> *COR} >> HEADFAITH.

Having said this, we can now easily conclude that the co-grammars in (7), all of which show remnants of markedness dominance, represent *linking paths* that connect the markedness grammars of early acquisition with the faithfulness grammars of advanced language development. In other words, we claim that the markedness and faithfulness grammars are not isolated from each other but rather are linked by what we call here *hybrid co-grammars*. This, in turn, entails that the learner does not follow a single path of linearly ordered grammars. On the contrary, the child enters into a network of manifold grammatical systems, which are interconnected by linking paths (see figure 1, section 4). Crucially, the existence of hybrid co-grammars provides empirical evidence in favor of constraint demotion. Children become gradually faithful to their target grammars by demoting clusters of markedness constraints. Furthermore, hybrid co-grammars represent a small fraction of children's production data, a fact that is expected under the present hypothesis. Linking paths represent transitional stages of development and cannot be more forceful numerically than core grammars. Actually, just 28% of the total number of di-/trisyllabic truncations (e.g. the examples in (6)) is the by-product of a hybrid grammar.

Finally, it should also be mentioned that the rankings in (7) constitute only some of the possible hybrid co-grammars. Constraint permutation provides all possible linking paths that progressively assist the acquisition of a final state of the adult

[3] Cf. Itô and Mester (1995); Orgun (1996), among others, for co-grammars in adult speech.

grammar. The rising number of possible co-grammars is not considered problematic for the theory nor for language acquisition per se, since multiple grammars facilitate language learning and provide alternatives towards the child's primary goal, namely the acquisition of the target grammar. Interestingly, the Greek acquisition facts reveal that children actually employ several alternative grammars in order to achieve this goal. In the following section, we present evidence for the emergence of a parallel positional faithfulness grammar, which, as will be shown, leaves a lesser statistical imprint on the production data than the core grammar.

3. Parallel grammar: faithfulness to the word initial consonant

A thorough examination of children's truncations in intermediate development reveals that children rely on more than one grammar. Specifically, we found out that a substantial fraction of their outputs cannot be accounted for by means of the ό-faithfulness grammar or by means of hybrid co-grammars. In such cases production focuses on the faithful preservation of the word initial consonant which is realized as the onset of the stressed nucleus of the target form. The monosyllabic and di-/trisyllabic truncations in (9) and (10), respectively, are telling. Let us start with the examples in (9). Interestingly, in these examples faithfulness to the initial segment is pursued at all costs. In (9a), for instance, the dorsal fricative /ɣ/ is retained even though it is more marked than the /k/ of the stressed syllable. Similarly, in (9b) the labial fricative /f/ supersedes the dorsal stop /g/, whereas in (9c) the labial /p/ wins over the dorsal /k/ of the stressed syllable and the coronal /t/ of the peninitial one.

(9) *monosyllabic truncations*

a	/ɣli.ˈko/	[ˈɣo]	'sweet'	D: 2;01.09
b	/fe.ˈga.ri/	[ˈfa]	'moon'	D: 2;06.29
c	/por.to.ˈka.li/	[ˈpa]	'orange'	B2: 1;11.28

Similarly, in di-/trisyllabic truncations consonants, which are more marked with respect to the manner and/or place of articulation than the onset of the stressed syllable in the adult form, are also retained in children's outputs. In (10a), dorsals and labials are realized at the expense of the more unmarked coronals. Moreover, in (10b), fricatives are preferred over stops regardless of voicing values. The same holds for the trisyllabic forms in (10c-d). Here, however, the initial syllable is often preserved at the expense of the non-initial one. In (10c), for instance, the leftmost syllable with the dorsal or labial onset is pronounced instead of the second one with the unmarked (coronal) onset. Finally, in (10d), fricatives win over stops.

(10) di-/trisyllabic truncations

a	/kra.ˈta.o/	[ˈka.o]	'hold-1sg'	F: 1;11.15
	/kar.ˈtu.la/	[ˈku.la]	'card-DIM'	B2: 2;01.05
	/pi.e.ˈro.tos/	[ˈpo.toθ]	'clown'	D: 2;03.28
b	/fri.ɣa.ˈnu.la/	[ˈfu.la]	'cracker-DIM'	D: 2;03.07
	/ɣu.ru.ˈna.ci/	[ˈɣa.ci]	'pig-DIM'	D: 2;03.14

c	/ka.ra.ˈme.les/	[kaː.ˈme.lec̟]	‘sweet-pl’	B1: 2;05.07
	/ka.la.ˈma.ci/	[kaː.ˈma.ci]	‘straw-DIM’	B1: 2;09.25
	/me.li.ˈti.ni/	[me.ˈti.ni]	‘Melitini’	D: 2;04.05
	/pe.ta.ˈlu.ða/	[pe.ˈlu.ða]	‘butterfly’	F: 2;07.17
d	/ɣu.ru.ˈna.ca/	[ɣu.ˈna.ca]	‘pigs-DIM.pl’	B1: 2;09.12
	/fo.to.ɣra.ˈfi.es/	[fa.ˈfi.eθ]	‘photograph-pl’	D: 2;04.05

Generalizing this pattern, we interpret cases as *pa.pa.ˈɣa.los* [ˈpa.lo] ‘parrot’ F: 1;11.28, *tra.ˈɣu.ði* [ˈtu.i] ‘song’ D: 2;03.14 as the result of positional faithfulness constraints and not as side-effects of markedness restrictions on the grammar.

Word initial position has been claimed to be more salient in perception and, by extension, in language processing (cf. Smith 2002 and references cited therein). Production data from Greek child speech add to the bulk of empirical evidence that confirms this observation. Special positional faithfulness constraints have been proposed in order to deal with the increasing evidence that neutralization of featural contrasts primarily affects perceptually non-salient positions (Beckman 1998 *et seq.*). The fact that in children's speech faithful productions target prosodically salient positions and, in particular, word initial consonants compels us to include the following positional faithfulness constraint in our analytical tools:

(11)#C-FAITH:[4] Preserve the input initial consonant and its features in the output.

The grammar responsible for the truncations in (9) and (10) takes the form of the constraint ranking in (12). Tableaux 5 and 6 illustrate the effects of the hierarchy that top-ranks #C-FAITH. It is important to emphasize that this secondary grammar co-exists together with the core grammar in (4) and the hybrid co-grammars in (7).

(12)#C-FAITH >> HEADFAITH >> *VOI, *FRIC, {*DORS, *LAB >> *COR}

T5 /fe.ˈga.ri/	#C-FAITH	HEADFAITH	*VOI	*FRIC	*DORS	*LAB	*COR
a [ˈpa]	*!	*				*	
b [ˈga]	*!		*		*		
☞ c [ˈfa]		*		*		*	

T6 /kar.ˈtu.la/	#C-FAITH	HEADFAITH	*VOI	*FRIC	*DORS	*LAB	*COR
☞ a [ˈku.la]		*			*		
b [ˈtu.la]	*!		*			*	

From the rank it occupies, #C-FAITH does not allow the markedness scales nor the sonority constraints to exercise any influence on shaping outputs. The preservation of the stressed nucleus reveals the absolute power of HEADFAITH.

The set of facts under examination confirms once again that positional faithfulness emerges before general faithfulness in intermediate stages of language development. Unfortunately, space limitations prevent us from further discussing this important finding here. Another issue that cannot be examined in the present

[4] The constraint comprises both #C-MAX and #C-IDENT[F].

study is the hybrid co-grammars that link the #C-faithfulness grammar to other parallel as well as remote grammars. The interested reader is referred to Revithiadou and Tzakosta (to appear) for extensive discussion of both issues.

As mentioned in section 2.1, each developmental stage is associated with a core grammar, that is, a statistically predominant grammatical system and several parallel co-grammars. The following table gives a picture of the distribution of faithfulness (co-)grammars that are active during the specific stage of language development. Note that line *a* in Table 1 represents only the part of the core grammar that refers to stressed initial syllables. The core grammar numbers several thousands of words, a fact that makes it impossible to provide a global overview of the distribution of the core grammar and the parallel co-grammars.

	Faithfulness grammars/ produced words	monosyllabic words	di-/trisyllabic words[5]
a	initial stressed syllable	79,3% (300)	26 % (37)
b	initial unstressed syllable + stressed nucleus	15,1 % (57)	45,1 % (64)
c	initial consonant + stressed nucleus	3,7 % (14)	28,9 % (41)
d	initial consonant + unstressed nucleus	1,9 % (7)	0 % (0)
	Total	**100% (378)**	**100 % (142)**

Table 1: Faithfulness grammars in advanced development

The last section summarizes the major findings of our discussion and concludes this paper.

4. Summary and conclusions

In this paper, we focused on intermediate stages of L1 phonological acquisition and maintained that they are associated with faithfulness grammars as opposed to initial states, which are primarily connected with markedness grammars. Interestingly, the examination of the data has revealed that grammars that promote positional faithfulness constraints emerge earlier than grammars that top-rank non-indexed faithfulness constraints. Moreover, on the basis of evidence from the Greek child speech, we proposed that language development is not linear but proceeds through a complex network of multiple parallel co-grammars. Furthermore, we claimed that at each state there is a core grammar, that is, a statistically predominant grammatical system. We have shown that in Greek the vast majority of children's productions arise from a stressed-syllable faithfulness grammar. In this grammar, templatic outputs that leave the segmental content of the stressed syllable in the target language intact are favored. Because of the numerical prevalence of such outputs, it constitutes the core grammatical system of this specific developmental stage. Alternatively, however, the Greek learners make use of several parallel co-grammars, which are not as prevalent as the core grammar. We specifically

[5] The statistics for di-/trisyllabic truncated forms come from two children only, namely F and D, whose data cover an extended part of the age range under investigation.

examined a co-grammar that favors the faithful realization of initial consonants (or syllables in longer truncations) of the adult forms.

Although the effects of markedness constraints diminish as acquisition progresses, we have shown that traces of markedness survive in hybrid co-grammars. That is, certain markedness constraints have been shown to exercise a limited influence on the segmental make-up of children's production data that realize, for instance, the stressed syllable of the target language. Hybrid co-grammars represent linking paths between initial (i.e. markedness grammars) and intermediate stages (faithfulness grammars) of acquisition, and hence play a crucial role in the development of the children's phonological system. The existence of hybrid co-grammars is in line with the claim that children become gradually faithful to their target grammars by demoting markedness constraints. With hybrid co-grammars, the *whys* and the *hows* of phonological acquisition stop being an unsolved puzzle. The following figure depicts the proposed model of L1 acquisition.

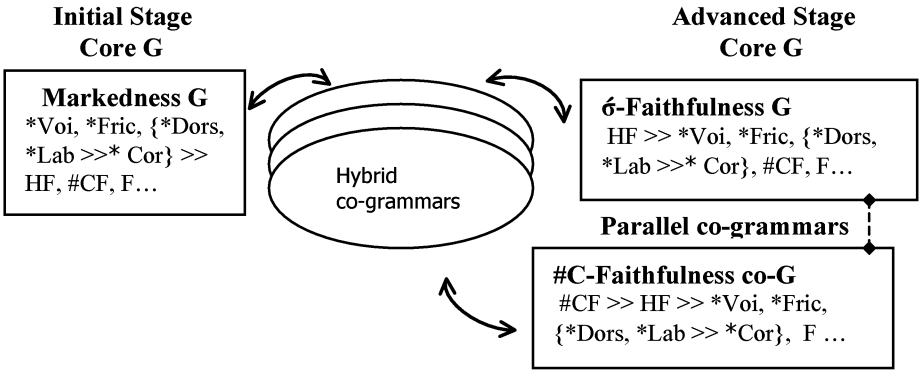

Figure 1: The network of multiple parallel grammars

To conclude, among the positional faithfulness grammars, the one that promotes featural realization of a stressed syllable is dominant suggesting that stress is the primary cue for the acquisition of Greek with leftmost edge next in line. Future research will shed more light on the role of positional faithfulness in child speech and the importance of hybrid grammars in language development.

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Sensitivity to Subject-Verb Agreement in Children with Developmental Language Disorders

A comparison of developmental dyslexia with SLI

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1. Introduction

Developmental dyslexia refers to an impairment in reading and writing, despite average intellectual ability and normal educational opportunity. The average population risk of developmental dyslexia is around 3-10%. However, the risk of first-degree relatives of dyslexics is estimated to be 40% (Gilger et al., 1991), suggesting a genetic component to the disorder. Converging evidence suggests that the source of the reading and writing problems is in the phonological domain, even though visual deficits are also observed in developmental dyslexia (Lovegrove, 1994).

Investigations into the language development of children with dyslexia have revealed (subtle) problems in the areas of lexical-semantics and syntax, next to their phonological problems. The present study focuses on sensitivity to subject-verb agreement. Existing experimental evidence on syntactic ability in developmental dyslexia will be discussed below.

1.1 Syntactic skills in developmental dyslexia

Several researchers have studied (the development of) syntactic skills in dyslexia. Studies conducted in the eighties revealed differences between dyslexic and control children in the comprehension of relative clauses and passive sentences (Mann et al., 1984; Stein et al., 1984). Waltzman & Cairns (2000) demonstrated that dyslexic children of around 8 years old had more problems with the interpretation of pronouns in some sentence contexts (application of principle B) than normally developing children. Problems with productive and receptive (morpho-) syntactic skills were also found to be differentiating between dyslexic and normally developing children when they were between 30-48 months old (Scarborough (1990, 1991). Lyytinen and co-workers (2001) investigated grammatical development of children with an increased risk of developmental dyslexia due to their familial background in a longitudinal study. The group of at-risk children produced significantly shorter sentences at 24 months as measured by calculating the mean length of utterances (MLU) compared to a control group. In addition, the at-risk children were more impaired in inflectional verb morphology and derivational morphology at 42 months relative to control children. Joanisse et al. (2000) found the production of tense morphology to be impaired in dyslexic children of around 8 years old. Sensitivity to subject-verb agreement in dyslexic children around 8 years of age was investigated by Rispens et al. (in press[ab]). In these studies, spontaneous speech was analysed on the production of agreement morphology in addition to administering a grammaticality judgement task. The results showed that dyslexic

children made more errors with the production of agreement and that they were less able to discriminate between grammatical sentences and sentences containing subject-verb agreement violations than normally reading children.

1.2 An overlap with SLI?

The language development of children with specific language impairment (SLI) is characterised by deficits within the phonological, lexical-semantic, syntactic or pragmatic modules of language (Leonard, 1998). In addition, around 50% of the children with SLI experience problems with word recognition and decoding (McArthur et al., 2000; Catts, 1993, 1995). Furthermore, McArthur et al. (2000) found in their study that around 50% of the children with dyslexia could also be classified as having SLI. As discussed above, children with dyslexia have been found to have problems with comprehension of relative clauses, passives, pronouns and with verb morphology. The same types of problems have been demonstrated in SLI. For instance, de Jong (1999) found production of inflectional verb morphology (tense and agreement) to be impaired in Dutch children with SLI (for English and other languages, see Leonard (1998)). Van der Lely and colleagues (1996, 1997) report problems with the interpretation of pronouns and passive sentences in English speaking children with SLI. Thus, at first sight an overlap seems to exist between developmental dyslexia and SLI. Children with dyslexia experience, next to their problems with word recognition and decoding, difficulties with oral language, whereas children with SLI have in addition to their impaired spoken language development often problems with literacy skills.

An important question to consider is whether this overlap in symptoms of dyslexia and SLI implicates that the two syndromes actually stem from the same mechanism, or whether dyslexia and SLI are, in fact, two qualitatively different syndromes.

Tallal & Piercy (1973), Tallal (1980), Merzenich et al. (1996) and Tallal et al. (1996, 1997) pursue the former idea. To their minds, language and reading difficulties stem from a deficit in the perception of rapidly changing acoustic features. This impairment (known as the temporal processing deficit) will impact on the learning of speech features, and, in turn, on the learning of language. Tallal and co-workers argue that there is a developmental continuum between early language disorders and phonologically based reading disorders and that it is primarily the factor age that distinguishes developmental language impairment from reading impairment (Tallal et al., 1997). Following this hypothesis, it will be assumed that dyslexia and SLI are furthermore distinguished by the severity of the disorder. The oral language problems of children with dyslexia seem less severe than those of children with SLI. Thus, in this sense dyslexia is a 'milder' form of SLI.

Snowling et al. (2000) argue against the view of SLI and dyslexia being two manifestations of one underlying disorder. Instead, they propose that the literacy problems often observed in children with SLI differ qualitatively from those of children with developmental dyslexia. Phonological processing deficits lie at the heart of the word decoding problems of children with dyslexia, whereas Snowling et al. (2000) suggest that limitations of oral language ability in SLI prevent children from using linguistic context when they are decoding text which interferes with the

development of word decoding skills. Catts et al. (1999) agree with the idea that oral language skills are related to word decoding. Children who have large vocabularies or have advanced grammars learn to recognise words faster than children with small vocabularies and weak grammatical skills. Language impairments furthermore prevent a child from compensating for a phonological deficit or weak word recognition skills by using their linguistic knowledge for contextual facilitation.

In sum, there is evidence that children with SLI and dyslexia experience the same types of problems. In the present study, children with developmental dyslexia will be directly compared with children with SLI to investigate commonalities between the two syndromes.

1.3 Research questions

The present study has been conducted to address the following research questions:

1). Are children with developmental dyslexia as sensitive to subject-verb agreement as children with SLI?

2). Are word recognition and decoding skills of children with SLI comparable to those of dyslexic children?

2. Methods

2.1 Subjects

Children with developmental dyslexia

20 children with developmental dyslexia (12 boys, 8 girls; mean age 8;08) participated in this study. The children were either diagnosed with developmental dyslexia by educational specialists or were in the process of being formally diagnosed. They were selected for this study on the basis of their reading level measured by a standardised test (AVI (Van den Berg, 1991[1])) used in schools to monitor reading progress. The AVI-scores of these children indicated a delay of at least one and a half years compared with the expected reading level based on age and school grade. In the Dutch school system, children enter primary school when they are four years old. The first two years correspond to kindergarten, after which they enter group three, the first year that they start with formal reading instruction. On average, children in the Netherlands are six years old when they start to learn to read.

All but one of the children attended main-stream primary schools. (Non)-verbal intelligence of 14 children was formally assessed by educational specialists as part of the diagnostic procedure. Children who had not (yet) been assessed (12 of the 26

[1] AVI (Analysis of Individualisation Form) is a reading test consisting of nine reading charts, each containing a text. Each chart corresponds to a level of technical reading ability. The test measures both accuracy and speed of reading.

children) were presented with the task 'figures'[2] (non-verbal task), 'similarities'[3] and 'vocabulary' (verbal tasks) of the Dutch version of the intelligence test battery WISC-R (van Haasen et al., 1986). Scores below 7 indicate poor performance, between 7-13 average performance and above 13 above-average performance. All children scored between 9 and 19 on the three tasks (mean score figures: 11, similarities: 13, vocabulary: 11), demonstrating at least average performance and indicating that all children had normal I.Q.'s.

None of the children had a history of speech and language therapy, nor were they currently enrolled in a speech and language training program. Some of the children received remedial teaching, specifically focused on their reading and or spelling problems.

Children with SLI

21 children with SLI (14 boys, 7 girls; mean age 8;05) were recruited from special schools for children with language impairment. The criteria of inclusion in the SLI group were a language impairment diagnosed by a speech and language therapist on the basis of standardised Dutch language tests, at least average non-verbal I.Q., measured by educational specialists as part of the review process in school, being a native speaker of Dutch and absence of any neurological deficits. There were no differences in chronological age between the group of children with SLI and developmental dyslexia.

Control children

18 Dutch children (9 boys, 9 girls, mean age 8;08) were selected to match the dyslexic children and the children with SLI on chronological age. All children had at least average reading skills, as assessed with the AVI-test, and showed normal progress in school.

2.2 Materials

Grammaticality judgement task

Grammatical and ungrammatical sentences were presented auditorily from a laptop computer (Toshiba Satellite). The correct sentences consisted of a subject, a verb and an object or an adverbial phrase (see the examples below in type 1-3). Apart from sentences containing agreement violations, sentences were presented in which a noun was missing from the Prepositional Phrase (PP); see type 4 for an example. This condition was inserted to see whether children were able to make

[2] In this task children are presented with pieces of a jig saw puzzle and are asked to solve the puzzle (make a figure) as fast as possible. The score depends on the accuracy and on the time the children need to accomplish the task.

[3] In the task 'similarities', children are presented with two concepts and are asked to explain why these concepts are related to each other (for instance 'marble'- 'ball' and 'meter' - 'kilo').

meta-linguistic judgements, so that if judging sentences with agreement violations prove to be difficult, it can be estimated whether this is the result of a more general problem with making grammaticality judgements (as reflected by a poor score on the control condition).

For the subject-verb agreement condition, ungrammatical variations on the Dutch inflectional paradigm were constructed:

Type 1). The verb was inflected for 1st person singular (also the verb stem) rather than the 3rd person singular:

* *De leuke clown maak een grapje* versus *de leuke clown maakt een grapje*

Lit. *the funny clown make [1st person sing./verb stem] a joke versus the funny clown makes a joke

Type 2). The verb was inflected for the plural form (also the infinitive) rather than the 3rd person singular:

**De leuke clown maken een grapje* vs *de leuke clown maakt een grapje*

Lit. *the funny clown make [plural/infinitive] a joke versus the funny clown makes a joke

Type 3). The verb was inflected for the 3rd person singular rather than for the plural form:

**De leuke clowns maakt een grapje* vs *de leuke clowns maken een grapje*

Lit. * the funny clowns makes [3rd person sing.] a joke versus the funny clowns make a joke

The control condition to investigate meta-linguistic judgement ability:

Type 4). Noun missing from a PP

*De jongen heeft in de gespeeld

Lit. *the boy has in the played

In total, the experiment consisted of 60 experimental sentences: 10 items were presented for each sentence type. All lexical items in the sentences had been selected on the criterion that 6 year old children will have mastered them using the vocabulary list of Kohnstamm et al. (1981). The determiners of the nouns of the third sentence type were all *de*-words and all nouns were marked for plural with /s/[4]. All words following the verb in the type 1 ungrammatical condition and all words, but one, following the verb in the type 1/2 grammatical sentences start with a vowel, rather than with a /t/ or a /d/ to prevent from co-articulation influences which would interfere with perception of the inflection morpheme; for example, *de jongen trapt tegen de boom* (the boy kicks against the tree), in which the /t/ of the verb *trapt* overlaps acoustically with the /t/ of the preposition *tegen*.

[4] In Dutch, the lexical form of determiners of singular nouns is either *de* or *het*, depending on gender, but the determiner of plural nouns is always *de*. Nouns can be marked for plural by either the suffix –en or –s.

On average, the noun phrases in subject position that preceded the verb in the agreement conditions consisted of 5 syllables (range 3-7, SD 1). The number of syllables preceding the critical verb between the conditions was comparable ($p>0.76$). Across the trials, correct and incorrect sentences were pseudo-randomised and divided over two blocks. The order in which the blocks were presented was varied.

Reading tasks

Two standardised reading tasks were administered: the one-minute real-word reading test (RWT) of Brus & Voeten (1972) and the two-minute pseudo-word reading test (PWT) of Van den Bos et al. (1994). These tasks tap word recognition (reading aloud words) and word decoding skills (reading aloud pseudo-words).

The term 'word recognition' is used in this paper to refer to the process that on visual perception of a word, it will be recognised if its printed representation is stored (in for instance, a so-called 'visual input lexicon' as suggested by Ellis & Young (1988). In addition, the activation of the representation in the 'visual input lexicon' may activate the semantic representation of the word. In contrast, pseudo-words or existing words that somebody does not know, do not have a representation in the 'visual input lexicon'. These words can only be decoded by converting graphemes into phonemes. This will result in a phonological representation, which can then be produced. Measuring both word recognition and word decoding skills of the participants thus taps two different processes involved in reading.

The RWT and PWT have been standardised similar to the WISC-R, with a mean standard score of 10 and a standard deviation of 3. A standard score below 7 indicates poor performance (Van den Bos, 1998).

2.3 Procedure and data analysis

The tasks were administered in a quiet room at school, or in a room at the dyslexia research centre spread over two sessions.

Grammaticality judgement task

The sentences were presented through headphones. A standardised introduction was presented to each child, explaining the idea behind the grammaticality judgement task. After that, an example block was started on the computer, containing three sentences (2 grammatical and 1 ungrammatical sentence) to practise the procedure. All example sentences were discussed to make sure the child understood the nature of the task. The child was instructed to press on one of two buttons of the laptop computer when s/he realised the sentence was good or bad. A sticker with a frowning face on one of the keys indicated an incorrect sentence, a sticker with a smiling face a correct sentence.

Responses were classified as correct or incorrect. The responses were differentiated for the four types of ungrammatical sentences (three types of subject-verb agreement violations, the incomplete PP condition) and the grammatical sentences matching the subject-verb agreement violations.

In addition, A' values were computed for the subject-verb agreement condition. This type of analysis adjusts the judgement scores for a possible bias of subjects to accept sentences rather than to reject them (cf. Linebarger, Schwartz and Saffran, 1983). The A' values can be interpreted as scores on a two-alternative forced choice task: 'which of these two sentences is grammatical?'. For example, an A' value of 0.8 can be interpreted as a score of 80% correct when the child was asked to select one of two sentences on its grammaticality. Following Rice, Wexler and Redmond (1999) the formula as described in Linebarger et al. (1983) was used to calculate these scores: $A'=0.5 + (y-x)(1+y-x)/4y(1-x)$ where y represents the correct judgements of grammatical sentences ('hits') and x the incorrect judgements of ungrammatical sentences ('false alarms'). If a child has a strong tendency to reject sentences, the A' value will be approximately around 0. A tendency to accept sentences as grammatical will result in an A' value of around 0.5 and good discrimination between grammatical and ungrammatical sentences will result in an A' value of approximately 1.0 (top score).

The reading tasks

The RWT (Brus and Voeten, 1972) and the PWT (Van den Bos et al., 1994) were administered in between the two parts of the grammaticality judgement task. The child was instructed to read aloud the words as fast as possible, but also as accurately as possible. The raw score was computed by subtracting the number of words that were read incorrectly from the total number of words read. The raw scores were converted into standard scores.

To compare performance between the three groups, a one way ANOVA was used. To determine significant differences between the groups *post hoc*, the Scheffé test was used. The Games-Howell test was used in the case of unequal variances between groups. Level of significance was set at $p<0.05$ and the homogeneity of variance was determined with Levene's test. To investigate the effect of sentence type, repeated measures analyses of variance were used. If there was more than one degree of freedom in the numerator, the Greenhouse-Geisser correction was applied (Stevens, 1996).

3. Results

Grammaticality judgement task

The judgement task consisted of three types of agreement violations and a control condition to assess general meta-linguistic ability. None of the children of the control and dyslexic groups showed problems with this control condition, in contrast with the SLI children. Ten of the 21 children scored less than 75% correctly on this condition, indicating that they either suffered from a severe syntactic impairment, or that their meta-linguistic skills were not fully developed yet. Such a problem with meta-linguistic awareness interferes with the interpretation of their results on the agreement conditions, as the scores in that case do not reflect a true indication of their morphosyntactic ability. Therefore, the ten children who 'failed'

the control condition were excluded from the SLI sample and their results on this task and on the other tasks were not analysed any further.

The mean percentages correct on the grammaticality judgement task are displayed in Figure 1. In order to protect the data against a possible bias of accepting sentences as grammatical, the statistical analyses will be done on the A' values. Table 1 shows the mean A' values of the three agreement conditions and the percentages correct on the control condition. A one-way ANOVA revealed a significant group effect for the three agreement conditions (type 1 $F(2,46)=60$, $p<0.001$, type 2 $F(2,46)=39.1$, $p<0.001$, type 3 $F(2,46)=27.4$, $p<0.001$). Games-Howell tests showed that the dyslexic children performed significantly worse than the control children on type 1 and 2 ($p<0.012$), and that there was a non-significant trend for type 3 ($p=0.087$). The SLI children always performed significantly poorer than the dyslexic and control children on all three types ($p<0.003$).

There was no effect of the type of violation ($F(2,92)=0.81$, $p<0.43$), nor an interaction between group and type of violation ($F(4,92)=0.88$, $p<0.46$). A mean score of all three types of agreement violations was calculated, see Table 1. A one-way ANOVA revealed significant group differences ($F(2,46)=61.9$, $p<0.001$), with the control children outperforming the dyslexic children ($p<0.003$) and the SLI children ($p<0.001$), and the dyslexic children outperforming the SLI children ($p<0.001$). Note that the mean A' value of the SLI group is around 0.5, indicating that their group performance does not exceed chance-level ($t(10)=1.0$, $p=0.31$). The dyslexics and controls performed well above chance-level.

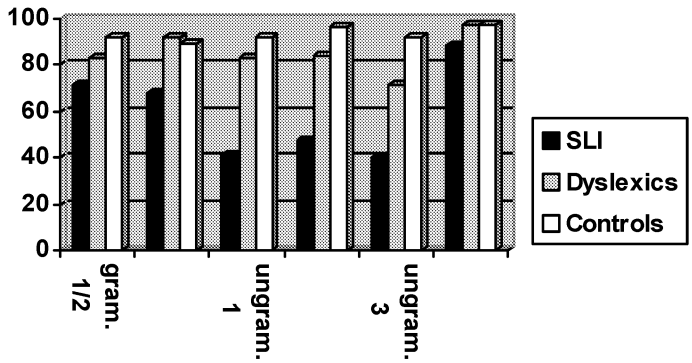

Figure 1. The mean percentages correct on the grammaticality judgement task.

Performance on the grammaticality judgement task was not 'all or nothing'. Especially the SLI children, but also the dyslexic children to a lesser extent, did not all score similarly on the task. Two SLI children demonstrated the ability to detect agreement violations, attaining overall A' values over 0.8 and two children showed on at least one of the three agreement conditions a high discrimination ability, demonstrating at least some sensitivity to agreement information.

The dyslexic children also showed some variability in their ability to detect agreement violations, not only between the individuals, but also, like the SLI children, between the three conditions. Ten of the children scored more than 1 standard deviation below the normative mean (normative mean A' value of 0.96, SD 0.03) and eight children scored across the three conditions more than 2 standard deviations below the normative mean. Two children had A' values of less than 0.65 on one condition (indicating performance at chance-level), but A' values of more than 0.9 on another condition.

Measure	**Dyslexics**	**SD**	**SLI**	**SD**	**Controls**	**SD**
A' type 1	0.89	0.08	0.60	0.15	0.96	0.04
A' type 2	0.92	0.05	0.53	0.28	0.97	0.03
A' type 3	0.88	0.12	0.55	0.25	0.95	0.06
Mean A' value	0.9	0.07	0.56	0.18	0.96	0.03
Control condition	97%	6%	88%	12%	97%	7%

Table 1. Mean A' values and the standard deviations (SD) on the three types of agreement conditions and the mean percentages correct of the control condition of the grammaticality judgement task.

Results of reading tasks

Pseudo Word Reading task:

The standard scores of all dyslexic children were below 7 (range 1-6), indicating subnormal performance (Van den Bos, 1998). Five SLI children had impaired decoding skills (standard scores ranging from 2-6), six SLI children had standard scores indicating normal word decoding skills (range 7-13), and all control children obtained standard scores of 7 or higher (range 7-17), indicating normal word decoding skills, see Table 2 for group averages.

Real Word Reading task:

Table 2 displays the mean standard scores of all three groups. The standard scores of all dyslexic children were below 7 (range 1-5), indicating subnormal performance (Van den Bos, 1998). Seven SLI children scored below the normative mean (range 1-6) and four SLI children obtained standard scores of 7 or higher (range 7-11). Two SLI children had normal standard scores on the PWT, but scored subnormally on the RWT. All control children obtained standard scores of 7 or higher (range 8-18).

Measure	**Dyslexics**	**SD**	**SLI**	**SD**	**Controls**	**SD**
PWT	4.1[ab]	1.5	7.4[a]	3.7	12	2.7
RWT	3.1[ab]	1.5	6.1[a]	3.3	11.9	2.7

Table 2. The standard scores on the PWT and the RWT.
[a] Score significantly lower than control group
[b] Score significantly lower than SLI group

4. Discussion

Previous studies demonstrated that children with dyslexia have more problems with agreement morphology than control children (Rispens et al, in press[ab]). The main aim of the present investigation was assessing whether children with dyslexia perform similarly to children with SLI on a task tapping sensitivity to subject-verb agreement. The results show first of all that children with developmental dyslexia and SLI have more problems with discriminating between grammatical sentences and sentences containing agreement violations than normally developing children. In turn, the group of dyslexic children outperformed the children with SLI on the grammaticality judgement task. Not only made the dyslexic children less errors than the children with SLI, but the scores also indicated that the dyslexic children scored above chance-level, whereas the mean A' value of the children with SLI did not exceed chance-level.

These results show that children with dyslexia and SLI experience the same type of deficits: they are both less sensitive to agreement morphology than normally developing children. The findings fit in with the idea that dyslexia and SLI result from the same type of disorder, but that children with dyslexia are less affected than the children with SLI. Of course, linguistic skills other than subject-verb agreement need to be assessed in order to be able to draw a conclusion about the similarity between the two disorders. Nevertheless, these data add to a linguistic typology of developmental dyslexia and show that there is overlap in the pattern of performance between children with dyslexia and SLI. Another question is whether the difficulties with agreement morphology spring from the same source in dyslexia and SLI. Data on phonological abilities and verbal working memory in both populations are now being analysed in order to address that question.

The data furthermore showed intra-group differences with respect to sensitivity to agreement morphology. Half of the children in the dyslexic group scored 1 standard deviation below the normative mean, indicating that the other half scored comparable to the normally developing children. These results underline the variability with respect to language performance, as observed earlier by McArthur et al. (2000). Furthermore, 9 of the 11 children with SLI scored around chance-level, with two children demonstrating sensitivity to agreement morphology, even though to a lesser extent than the normally developing children. Again, these data suggest the need to look beyond group comparisons. More research is needed to investigate these within group differences.

The scores on the reading tasks of the children with SLI also show that there is great individual variability. Five of the eleven children scored subnormally on the pseudo-word reading task, whereas the scores of the other six children fell within the normal range. These data are, again, in line with the observations of McArthur et al. (2000) and Catts (1993, 1995) who found that around 50% of the population with SLI can also be classified as dyslexic.

In sum, children with dyslexia were found to have more problems with discriminating between grammatical sentences and sentences containing agreement violations than normally developing, which was the same for children with SLI. These children performed more poorly than the children with developmental dyslexia, supporting the idea that developmental dyslexia represents a 'mild' form of

SLI. In line with other research, it was found that half of the children with SLI scored subnormally on a word decoding task. Currently, the relation between agreement morphology, word decoding and phonological (processing) abilities is being investigated for a better understanding of the data.

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Recursion as an Analytic Device in Acquisition*

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1. Introduction

The child's linguistic input often includes evidence for incorrect grammatical analyses. For instance, the child acquiring English will hear sentences such as "Here comes the train," but English is not in general a V2 language. How does the child know which evidence to trust?

Could one V2 sentence shift a major parameter? Or perhaps block a child's progress, because the input contains an unresolvable contradiction? Although classic learnability theory assumes that a single example can suffice to change a parameter, we argue that there has to be a method to filter out certain sentences. Otherwise, the child will be paralyzed by contradictory (e.g. V2 and non-V2) input.

In this paper we propose that recursion plays a central role in the differentiation of "exceptional" domains from truly productive grammar. As argued by Hauser, Chomsky and Fitch (2002), recursion is the central characteristic of core grammar. Our proposal is that recursion tells the child when a productive, grammatical operation has applied.

2. Nominal compounding

For example, both English and French employ nominal compounds such as *frog man* or *homme grenouille* (literally 'man frog', for 'underwater diver'). Yet, only in English is there a productive grammatical process of nominal compounding. Correspondingly, only in English is it common to find recursive nominal compounds:

(1) a. [frog man]
b. [[frog man] team]

(2) a. [homme grenouille]
man frog
b.?* [équipe [homme grenouille]]
team man frog

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* Sections 1-2 and 6-7 of the present paper are also included in (Snyder & Roeper, to appear). We are indebted to Mark Barker for his assistance with the material on Serial Verb Constructions. We are also grateful to Sonja Eisenbeiss, Christina Schmitt, Ana Perez, and Robert Moll; and to the audience at GALA 2003, including in partcular Harald Clahsen, Peter Coopmans, Jill DeVilliers, Nina Hyams, David LeBlanc, and Kamil Ud Deen, for many helpful comments and suggestions. Snyder's contributions were supported in part by NIH grant DCD-00183.

Two-term compounds such as *homme grenouille* are readily stored as frozen forms in the lexicon, but in the vast majoity of cases, compounds of three or more terms are the result of a recursive compounding operation.

On our proposal, hearing a nominal compound within another nominal compound is what tells the child learning English that nominal compounding is a productive operation. Roeper, Snyder, & Hiramatsu (2002) have shown that three-term compounds (e.g. [[*Christmas tree*] *cookie*]) are robustly present in the input to English-learning children, and could indeed be the basis for deciding that root compounding is a productive grammatical process in English.

Next we examine a mirror-image case: How does the child acquiring English resist the temptation to analyze English as allowing Serial Verb Constructions (SVCs)? Our proposal is that utterances in the English input that resemble SVCs lack the crucial property of recursion.

3. Verb serialization

Some of the world's languages are "serializing," and permit SVCs. Examples from the creole language Sranan (Baker 1989, after Jansen, Koopman, & Muysken 1978) are provided in (3-4).

(3) Mi e **teki** a nefi **koti** a brede. (Baker, p.537)
I Asp **take** the knife **cut** the bread
"I cut the bread with the knife."

(4) Mi **fringi** a batra **broko**. (Baker, p.516)
I **throw** the bottle **break**
"I threw and broke the bottle."

Baker (1989) argues that serializing languages allow both "Serial Verb Constructions Proper" and "Covert Coordination." The general characteristics observed in both constructions are given in (5).

(5) Characteristics of Serializing Languages:
a. Allow a sequence of verbs to appear within a single clause;
b. The verbs share a single structural subject;
c. The verbs *may* share internal arguments.

At this point we encounter the learnability puzzle: How does the child acquiring a non-serializing language such as English resist the temptation to posit serialization? The temptation will come from examples like those in (6).

(6) a. Sue can **come eat** lunch now.
b. John should **help** Mary **clean** the house.

In (6a-b), two verbs appear within the same clause, are interpreted relative to the same Tense head, and (plausibly) share a single subject. (In (6b), treating John as a co-agent of cleaning will be fully consistent with the sentence's truth conditions.)

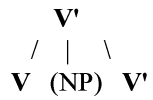
The verbs do not share an internal argument, and therefore cannot be analyzed as Serial Verb Constructions Proper, but they can still be analyzed as examples of Covert Coordination.[1]

Nonetheless, children with English input grow up to be adults who disallow serialization as a productive grammatical option. This can be seen clearly from the ungrammaticality of examples like (7).

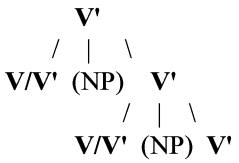
(7) * Mary should **take** the knife **cut** the bread.

How does the child decide? On our proposal, the basis for the decision could be the absence of recursive serialization in the input. To see what recursion would look like, consider Baker's (1989) analysis of serialization.

For Baker, serialization involves the syntactic composition of two separate V projections (with separate V heads) into a single VP. This is illustrated in (8), where the topmost V' takes both a V and another V' as daughters.

(8)


In a serializing language such as Sranan, this operation can apply recursively, to yield a VP with three or more V heads, as in (9).

(9)


Our proposal, then, is that the child refrains from positing serialization as a grammatical option until encountering an example like (10) (with three or more verbs).

(10) Kofi [**fringi** a tiki [**fadon** [**naki** Amba]]]. (cf. Baker p.550, after Sebba 1987)
Kofi **throw** the stick **fall hit** Amba
"Kofi threw the stick down at Amba (and hit her)."

A problem, however, is that even in English there can be examples with three or more verbs, such as "John will **go help** Mary **cook**". Indeed, the truth conditions for this example are compatible with the typical "conjunctive" semantics of an SVC: John will go, and he will help Mary, and Mary will cook. Yet, while three-term

[1] One might question whether the child acquiring English will ever receive input that could be misanalyzed as a Serial Verb Construction *Proper*, with a shared internal argument. Causatives could, in principle, yield such cases: For example, the sentence *John made the vase break* could, in certain contexts, be misconstrued as an SVC Proper meaning "John made and broke the vase."

examples of this type are grammatical, they will pose a problem for our learnability account *only* if they are robustly present in the input. The question, then, is the frequency of such examples in child-directed speech.

4. Case study: Naomi

A case-study of maternal input to the child Naomi, in the Sachs corpus (Sachs 1983, MacWhinney 2000), indicates that such three-term examples are *not* present in sufficient quantity to confuse the English-learning child.

The Sachs corpus contains samples of mother-child interactions from the time the child is 1;1 to 5;1, and includes some 8,843 maternal utterances. We hand-coded all maternal utterances containing one or more of the following verbs, each of which permits a small-clause complement: *come, go, see, hear, watch, help, make.* For each such utterance, we asked: Could the child interpret this as a two-term SVC? As a three-term SVC?

Our results were that 47 of the mother's utterances could be interpreted as containing a two-term SVC (for a frequency of about one such utterance per hour of child-directed speech). Representative examples are provided in (11).

(11) *MOT: **come look** at the picture of the horse .
*MOT: want to **go see** the snow ?
*MOT: you **watch** Mommy **clean** .

Yet, no utterance (in approximately 50 hours of child-directed speech) could be interpreted as an SVC of three or more terms. Hence, clear evidence of recursive serialization is plausibly what the child requires, before deciding that the language allows serialization as a grammatical option.[2]

5. Adjectives

Our discussion thus far has considered recursion with nouns and verbs. If they are representative of a larger class, then we predict that the remaining lexical category, adjectives, will pattern in the same way. Attributive adjectives in French are an ideal testing ground. Single adjectives can sometimes appear before the noun (12a), but recursion is normally postnominal (12b):

(12) a. *une belle chemise* "a beautiful shirt"
b. *une chaise ronde rouge* (lit.) "a chair round red"

On our proposal, the French child could rely on evidence of recursion to decide whether a given position (prenominal or postnominal) is routinely available to attributive adjectives. A prediction is that child-directed French should be free of

[2] As pointed out to us by Harald Clahsen and Kamil Ud Deen, an important, as yet untested prediction is that the child-directed input in serializing languages (such as Sranan) does indeed contain examples of recursive serialization, with three or more verbs. We do not, at present, have the means to test this prediction.

the exceptions (multiple prenominal adjectives) found on rare occasions in adult French. As reported in (Snyder & Roeper, to appear), this prediction appears to be correct.

6. The forms of recursion

Now we can consider a larger question: Is the acquistional role of recursion limited to the lexical categories? In fact, recursion is present in many domains of grammar, each of which makes special demands on the child. Here we briefly sketch a larger framework. It remains our goal to explore this framework in more refined empirical and technical detail.

The first question to ask is where we can see recursion on the surface of language. With this information we can imagine the path that the child takes in identifying recursion. A child will most probably use phonological identity as a first clue: *and....and...and* at the sentence level, or the presence of duplicated morphemes (*re-re-re-read*) at the morphological level. Recognizing categorial recursion, of the kind discussed in the previous sections, will be the next demand on the acquisitional system.

Here it is useful to have a simple overview of some grammatical domains in which recursion appears. At the level of sentences, recursion is found in every grammar: Every language allows the embedding of one sentence inside another. Yet, certain forms of sentence recursion are subject to cross-linguistic variation. In languages like English we find embedded relative clauses on all NP's. In other languages, though, relatives are permitted on objects but not on subjects.

At the inflectional Level, German allows multiple modals, but English does not:

(13) Er muss singen können.
he must sing can
"He must be able to sing."

At the verbal level, verb complementation is present in every language, but there is substantial lexical sensitivity. At the prepositional level, English has recursive prepositions, as in *John walked on out the door*, but these are not present in all languages. Prepositions also must be differentiated from particles, which are are not directly recursive. Finally, at the determiner level we find that Greek, for example, allows the repetition of articles on adjectives. Marinis (2000) shows that this is recognized by children very early:

(14) Christos 2.8:
Pu ine i mavri i ali i boghia?
where is the black the other the colour

As discussed by Eisenbeiss and Roeper (2001), inflections inside the determiner system engage recursion in yet another way, and their proper representation constitutes a challenge to both the linguist and the child. Numerous other, entangled forms of recursion are found in the languages of the world, at every level of grammar.

At present one distinction strikes us as especially important: Recursion can be either direct or indirect. The lexical categories typically allow direct recursion:

(15) AP → A (AP)

Sentence recursion, however, is typically indirect, in the sense that another type of node intervenes. Stated in terms of traditional categories, the sentence (S) does not directly generate another sentence, but rather a VP within which S recurs:

(16) S → NP VP
VP → V (S)

This distinction looks important from the perspective of learnability, because the difficulty of recognizing the recursion will plausibly be greater for indirect recursion. Here we provide a brief case-study that illustrates a few of the crucial concepts.

Alongside (17a), which would correspond to simple case-assignment in some languages, English allows recursive prenominal possessives, as in (17b).

(17) a. John's house
b. John's friend's sister's house

German disallows such embedded genitives. Yet, it does allow the genitive, as a case-marker, to recur within a DP on both the determiner and the noun, as in (18).

(18) des Mannes
"the's man's"

How does the child determine that English has true recursive possessives, while German marks one inflection in two places? One clue lies in the scope properties. If we point to "my friend's sister's car," a child can see that it is not "my friend-and-sister's car," for example. It follows that each *–s* morpheme marks a separate possession relation. Their order indicates their (recursive) embedding relation, and hence, their meaning relation.

Another indication to the child could be hearing a sentence like (19), which shows that the possessive applies to an entire phrase, and therefore must permit indirect recursion:

(19) [the man on the corner]'s hat

We can capture the indirect relation through phrase-structure representations, as in (20).

(20) DP → Spec [D [N (PP)]]
D → *'s*
Spec → DP

The indirect recursion allows an entire phrase to appear inside the possessive, which can then include another possessive:

(21) [[my friend]'s sister]'s car

Attention to the context, and thus to the likely interpretation of such utterances, will (eventually) allow the child to recognize the recursive phrase structure. This recognition is what will allow the child to differentiate English possessives from the German type.

Our approach now makes a prediction for English possessives: Young children will succeed at single possessives, but will resist recursive possessives until there is sufficient evidence of recursion (cf. 17b, 19) in the input. We thus predict a stage in which the child can comprehend or produce only a single possessive. More generally, we predict that children will initially resist indirect recursion.

There are virtually no examples of English-learning children using recursive possessives, and there is clear evidence that they have difficulty understanding them. Below we provide a few representative examples from Brown's (1973) data for Sarah.

MOTHER: that's like um what's Auntie Marian's doggie's name?
what's Auntie Marian's puppy's # dog # name?
what's Auntie Marian's puppy's name?
SARAH: (unclear)

MOTHER: huh?
what's your… what's….what's your cousin Arthur's Mummy's name?
SARAH: I don't…..
your cousin ?.

MOTHER: yeah, Arthur… Arthur… what's his Mumma's name?
SARAH: I want pin.

7. Conclusions

Universal Grammar allows many different grammatical structures, but any given language permits only a subset of them as productive options. Evidence of recursion is an excellent indication that a particular structural option is indeed productive, rather than an isolated exception. Moreover, case-studies of nominal compounding, verb serialization, and attributive adjectives indicate that evidence of recursion in child-directed speech corresponds closely to the options that are in fact productive in the adult language. Finally, in the case of English possessives, the distinction between direct and indirect recursion corresponds to points of grammar that are mastered early versus late. Our conclusion is that evidence of recursion plausibly plays a central role in the child's acquisition of grammar.

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Participial Constructions in Child Grammar: Correlations with Verb Movement Properties

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1. Introduction

In this paper, we investigate the development of participial constructions, specifically the present perfect construction, from a cross-linguistic perspective. We will account for previously unobserved differences regarding auxiliary omission within this construction in the acquisition of monolingual Spanish, German, Italian, and French. A quantitative analysis of the data of 10 children (age range 1;6-2;8) acquiring these four languages shows substantial differences with regard to the types of participial constructions that are produced, i.e. full-fledged present perfect forms (containing both an inflected auxiliary and a past participle) versus bare past participles, in which the auxiliary has been omitted. (1) and (2) provide examples of these two types of participial constructions from the various child grammars under investigation.

(1) Full-fledged Present Perfect
   a. Lo *he dicho* yo.
      3sgOcl have said I
      "I have said it."
      (Spanish)
   b. Mamma se n' *è andata.*
      Mom refl. cl. is gone
      "Mom has gone."
      (Italian)
   c. J' *ai travaillé* à l'école.
      I have worked at the school
      "I've worked in school."
      (French)

(2) Bare Past Participle
   a. Schale *mitgebracht.*
      peel with-brought
      "I brought the peel with me."
      (German)
   b. Disegno *cascato.*
      picture fallen
      "The picture has fallen."
      (Italian)
   c. *Vu* voiture.
      seen car
      "I have seen the car."
      (French)

We will show that the child grammars under investigation differ in their use of these two types of participial constructions, in that some (such as Spanish) use only the full-fledged present perfect form, others (such as German) only the bare participle form, and yet others (such as Italian and French) make use of both forms. Such differences between the child grammars are unexpected, given that the respective adult grammars do not differ from one another in the same manner. As is evident from Table 1, the proportion of full-fledged present perfect constructions is comparable in the adult grammars of all four languages under investigation.

Language	Aux+Participle	Bare Participle
Spanish	99.7% (285/286)	0.3% (1/286)
German	94.6% (245/259)	5.4% (14/259)
Italian	96.4% (106/110)	3.6% (4/110)
French	99.4% (480/483)	0.6% (3/483)

Table 1: Proportion of Full and Bare Participles in the Adult Grammars[1]

We propose that these asymmetries in child participial constructions are derived from the interaction between (i) language-specific participle movement properties (which are correlated in a way to be explained to the two different types of participial constructions), and (ii) a universal principle of tense omission, Tense Deletion up to Recoverability (TDUR).

The remainder of the paper is organized as follows. Section 2 presents the results of the quantitative analysis comparing the patterns of auxiliary omission in the participial constructions of the various child grammars under investigation. Section 3 outlines some important theoretical assumptions for our analysis of the observed auxiliary omission patterns. Section 4 contains our analysis of the observed auxiliary omission patterns, and section 5 concludes this paper.

2. Auxiliary Omission in Child Spanish, German, Italian, and French

The data used for this study come from two monolingual Spanish-speaking children, three German-speaking children, three Italian-speaking children, and two French-speaking children (age range 1;6-2;8) all of which are available on CHILDES. Details about the different language corpora are provided in Table 2.

Language	Child	Age	Source
German	Caroline	1;8-2;3	Nijmegen Corpus/CHILDES
	Kerstin	1;6-2;6	Nijmegen Corpus/CHILDES
	Julia	1;11-2;5	Clahsen Corpus/CHILDES
Spanish	Maria	1;8-2;8	Ornat Corpus/CHILDES
	Emilio	2;0-2;8	Vila Corpus/CHILDES
Italian	Diana	1;8-2;6	Calambrone Corpus/CHILDES
	Martina	1;11-2;7	Calambrone Corpus/CHILDES
	Viola	2;0	Calambrone Corpus/CHILDES
French	Gregoire	2;0-2;8	Champaud Corpus/CHILDES
	Philippe	2;0-2;8	Léveillé Corpus/CHILDES

Table 2: Child Language Corpora for German, Spanish, Italian, and French

The files were coded for full-fledged participles, containing an overt auxiliary in addition to the past participle, and bare participles. Our findings with respect to the distribution of full participle versus bare participle constructions in the child grammars of the languages under investigation are as follows. As indicated in Table

[1] These percentages were calculated based on quantitative analyses of adult input excerpts from the CHILDES corpora listed in Table 2.

3, Spanish monolingual children show a very strong preference for the full-fledged present perfect form. They use this form almost exclusively, that is about 94% of the time. By contrast, bare participles are virtually absent from the data. Hence, we propose that auxiliary omission in participial constructions is *not* available in the grammars of Spanish-speaking children.

Child	Aux + Past Participle	Bare Past Participle
Maria	93.6% (103/110)	6.4% (7/110)
Emilio	94.1% (48/51)	5.9% (3/51)
mean	*93.8%*	*6.2%*

Table 3: Spanish Proportion of Full Participle and Bare Participle Constructions

German monolingual children, on the other hand, display the mirror image of what we have observed in Spanish: they produce almost only bare participles, which represent on average 96% of participial constructions, as illustrated in Table 4. Behrens (1993) provides additional data in support of such a generalization from Daniel and Mathias, who first start using the full-fledged present perfect form at ages 3;0 and 2;11 respectively, and up until then only use bare participles[2]. Thus, given that German-speaking children use almost exclusively bare participles, we shall generalize that auxiliary omission is obligatory in the participial constructions of German speaking children.

Child	Aux+Past Participle	Bare Past Participle
Caroline	1.4 % (1/70)	98.6 % (69/70)
Kerstin	10% (3/30)	90% (27/30)
Julia	0% (0/3)	100% (3/3)
mean	3.9%	96.1%
Behrens (1993)		100%

Table 4: German Proportion of Full Participle and Bare Participle Constructions

Unlike Spanish and German children, Italian and French speaking children use both forms of the participial construction as evident in Tables 5 and 6.

Child	Aux+Past Participle	BarePast Participle
Diana	87.7% (114/130)	12.3% (16/130)
Martina	53.7% (29/54)	46.3% (25/54)
Viola	66.7% (4/6)	33.3% (2/6)
mean	*77.4%*	*22.6%*
Franchi (2002)		22% - 54%

Table 5: Italian Proportion of Full Participle and Bare Participle Constructions

[2] Also, Schlyter (1990) in her study of three French-German bilingual children finds that in German the present perfect is not used until age 2;10, 3;4, and 2;7 respectively.

Table 5 shows that Italian-speaking children use the full-fledged present perfect form, on average, 77% of the time and bare participles about 23% of the time. These data are also supported in a study by Franchi (2002), who reports an auxiliary omission rate in three Italian children (age range 1;7-3;3) ranging from 22% to 54%.

Child	Aux + Past Participle	Bare Past Participle
Gregoire	90.6% (163/180)	9.4% (17/180)
Philippe	66.2% (92/139)	33.8% (47/139)
mean	*79.9%*	*20.1%*

Table 6: French Proportion of Full Participle and Bare Participle Constructions

French-speaking children display a pattern strikingly similar to that of Italian-speaking children. Their data display roughly 80% full-fledged present perfect forms and 20% bare participles as shown in Table 6 above. Meisel (1985), Schlyter (1990), and Rasetti (2003) confirm that such optionality with regard to the use of the two participial constructions exists in the child grammar of French. Therefore, auxiliary omission in participial constructions appears to be optional in child Italian and French.

In sum, we have observed a three-way asymmetry with regard to the possibility of auxiliary omission in the child grammars of Spanish, German, Italian and French. Spanish does not allow omission of the auxiliary in participial constructions, which leads to the production of full-fledged present perfect forms exclusively. Conversely, child German requires obligatory auxiliary omission, and thus turns out bare participles exclusively. Child Italian and French allow for optional auxiliary omission, which results in the occurrence of both bare participles and full-fledged present perfect forms. In what follows, we provide an analysis of these observed asymmetries.

3. Theoretical Background

3.1 Participle Movement in the Adult Grammars

In the literature on participial constructions, the idea that a participle is somehow closely connected to the auxiliary has been expressed by a number of authors in a number of ways (Gueron & Hoekstra (1988), Grimshaw (1991), Shlonsky (1997)). Although these proposals are rather different from one another, they share a common core, namely, they attempt to formalize and cast in theoretical terms an observable dependency between participles and auxiliaries.

In our analysis we adopt the proposal of Shlonsky (1997), which stipulates that the close relationship between the participle and the auxiliary in the participial construction is expressed by movement of the participle to T, where it incorporates and therefore forms a complex head T^0 with the auxiliary. Shlonsky argues that such a movement is universal and obligatory. Languages differ from one another only in that some languages (such as Hebrew, Polish, or Rumanian) have participle incorporation in overt syntax, while other languages have participle incorporation at LF. We propose that part of the asymmetry between the participial constructions in the various child grammars follows from the different properties that these

languages possess with respect to participle movement. More specifically, the participle moves to T in overt syntax in some languages, while it moves to T at LF in other languages.

Spanish is a language for which it has been suggested that the participle and the auxiliary form a unit in overt syntax (Torrego (1984), Suñer (1987), Zagona (1988)). It is a well-known fact that no lexical material can intervene between the auxiliary and the participle in Spanish, as evidenced in the examples in (3).

(3) a. Juan *ha comido.* — *Aux^Participle*
John has eaten
"John has eaten."

b. *Juan *ha* ya *comido.* — **Aux^XP^Participle*
John has already eaten
"John has eaten already."

Based on this observation, Zagona (1988), for example, argues that the participle incorporates into the auxiliary in overt syntax, forming an inseparable unit. Applying Shlonsky's terminology, we argue that Spanish is a language that displays overt participle movement to T, where the auxiliary and the participle form a complex head T^0 in overt syntax.

For German, the hypothesis of overt incorporation is highly implausible. Given that German is a V2 language, with a head-final TP, a variety of lexical material is able to intervene between the auxiliary and the participle, as shown in (4).

(4) a. Hans *hat gegessen.* — *Aux^Participle*
John has eaten
"John has eaten."

b. Hans *hat* schon *gegessen.* — *Aux^XP^Participle*
John has already eaten
"John has eaten already."

c. Hans *hat* den Apfel *gegessen.* — *Aux^XP^Participle*
John has the apple eaten
"John has eaten the apple."

d. Den Apfel *hat* Hans *gegessen.* — *Aux^XP^Participle*
The apple has Hans eaten
"John has eaten THE APPLE."

e. Hans *hat* den Apfel gestern schon gegessen. — *Aux^XP^n^Participle*
Hans has the apple yesterday already eaten
"Hans has eaten the apple already yesterday."

Thus, following Shlonsky's hypothesis, we argue that, in German, movement of the participle to T and subsequent incorporation with the auxiliary takes place at LF.

Similarly, Italian and French are languages for which an overt unit-formation hypothesis for the auxiliary and the participle has been rejected (see, for example, Belletti (1990)). In these languages, certain adverbial and negative elements can intervene between the auxiliary and the participle as well, as shown by the examples

in (5) and (6). Consequently, we assume that the participle in these languages undergoes participle movement to T and incorporation with the auxiliary at LF.

(5) a. Gianni *ha mangiato.* *Aux^Participle*
John has eaten
'John has eaten.'

b. Gianni *ha* giá *mangiato.* *Aux^XP^Participle*
John has already eaten
'John has eaten already.'

(6) a. Jean *a mangé.* *Aux^Participle*
John has eaten
'John has eaten.'

b. Jean *a* dejà *mangé.* *Aux^XP^Participle*
John has already eaten
'John has eaten already.'

Under these assumptions the available options for participle movement in the adult grammars of the languages under investigation can be summarized as in Table 7.

Language	Participle Movement Parameter	
	Overt Movement	Covert Movement
Spanish	√	
German		√
Italian		√
French		√

Table 7: Participle Movement Parameter in the Adult Grammars

Spanish displays overt movement of the participle to T, while in the remaining three languages the participle movement parameter is set to "covert." However, language-specific parameterization of participle movement alone cannot derive the patterns of auxiliary omission in the child grammars of these languages. We propose that a universal principle of tense omission is operative in child grammar, and that the interaction of this principle with the participle movement properties discussed above accounts for the observed differences between the languages under study.

3.2 Auxiliary Omission: Tense Deletion up to Recoverability (TDUR)

The basic idea underlying our analysis of auxiliary omission is a commonly adopted one concerning the defunct nature of Tense in child grammar. Optional tense omission in child grammar has frequently been employed in order to account, for instance, for the co-occurrence of finite and non-finite verb forms during the RI stage of language acquisition (see, for example, Wexler (1994), Rizzi (1994), Hoekstra & Hyams (1998)). In earlier work (Berger-Morales & Salustri (2002)), we have made use of this idea of Tense omission, but extended it by proposing that

children omit Tense *obligatorily* up to *recoverability*. We labeled this principle Tense Deletion up to Recoverability (TDUR), as in (7).

(7) *Tense Deletion up to Recoverability (TDUR):*
The Tense head is obligatorily deleted (i.e. not pronounced) in the child's grammar up to recoverability (i.e. as long as the lexical properties of the verb can be recovered).

Importantly, such a definition of recoverability predicts the following for participial constructions. Under the assumption that the auxiliary itself has no meaningful content (see, for instance, Wexler (1998)) the deletion of the auxiliary in participial constructions is forced as long as the preservation of the participle is guaranteed, since the latter provides recoverability of the verbal meaning. Such a situation is provided if the auxiliary alone occupies the Tense head in overt syntax, and the participle does not incorporate until LF. On the other hand, if the auxiliary and participle both occupy the Tense head in overt syntax, as in the case of overt participle movement, no deletion of material can take place under TDUR.

4. Analysis of Auxiliary Omission Patterns in the Child Grammars

In this section, we will show how this universal principle of Tense omission interacts with the language-specific settings of the participle movement parameter in such a way that it derives straightforwardly the observed asymmetries in auxiliary omission patterns between the child grammars of the four languages under investigation.

4.1 The Straightforward Cases: Spanish and German

Recall that Spanish-speaking children virtually never omit the auxiliary in participial constructions, while German-speaking children omit the auxiliary obligatorily.

As in the adult grammars, Spanish-speaking children set their participle movement parameter to the "overt" value, while German-speaking children set theirs to the "covert" value. Crucially, we assume that in both child Spanish and child German, this parameter has already been fixed to its target-consistent value at the stage of acquisition under investigation. Given these assumptions, TDUR predicts three S-structure scenarios for participial constructions in child Spanish.

Scenario (a) in Table 8 shows the participle having undergone overt movement to T, as the setting of the participle movement parameter in child Spanish dictates. TDUR cannot apply, since the deletion of the complex head under T, which contains both the auxiliary and the participle, would render the lexical meaning of the verb unrecoverable. Consequently, a full-fledged present perfect form surfaces.

	T^0	$AgrPrt^0$	Comments
a	[aux participle$_i$]	t_i	Overt participle movement to T, incorporation with aux, followed by prohibition of T head-deletion under TDUR, results in a full-fledged present perfect form.
b	* ~~aux~~	participle	Not a possible scenario in the child grammar due to setting of overt participle movement parameter.
c	~~*[aux participle$_i$]~~	t_i	Not a possible scenario in the child grammar due to non-recoverability of verbal content.

Table 8: S-Structure Scenarios for Spanish Participial Constructions under TDUR

Neither scenario (b) nor scenario (c) are possible in the child grammar of Spanish; the former because covert participle movement is not an option, the latter because recoverability is not satisfied when the entire verbal complex deletes. Given the possibility of (a) and the impossibility of (b) and (c), auxiliary omission does not apply in child Spanish, and only full-fledged present perfect forms occur.

As far as German is concerned, TDUR predicts the following scenarios in Table 9.

	C^0	T^0	$AgrPrt^0$	Comments
a	*[aux participle$_i$]$_j$	t_j	t_i	Not a possible scenario due to the setting of covert participle movement parameter.
1	~~aux$_i$~~	t_i	participle	Covert participle movement to T, aux deletion under TDUR, results in a bare participle.

Table 9 S-Structure Scenarios for German Participial Constructions under TDUR

Scenario (a) is ruled out in the child grammar of German, since overt movement of the participle to T (and subsequent movement of the complex head to C) is impossible due to the participle movement parameter being set to the "covert" value. Scenario (b) implies covert participle movement, and TDUR forces deletion of the Tense head, which contains the auxiliary, under C. The resulting bare participle ensures recoverability of the lexical properties of the verb. Given that (b) is the only possible scenario, obligatory auxiliary omission in child German is accounted for.

Thus, the interaction of TDUR with the target-consistent parameter settings in the child grammars straightforwardly derives the patterns showing lack of auxiliary omission in Spanish and obligatory auxiliary omission in German. Given that adult Italian and French have the same parameter setting value as German does, namely "covert" we might want to infer that Italian and French-speaking children will exhibit the same pattern of auxiliary omission as the German-speaking children. However, as we have seen in Tables 5 and 6, this is not the case. Instead, auxiliary omission is *optional*, and not obligatory, in Italian and French child grammars. In the following section, we will resolve this puzzle by showing that the observed

optionality is due to a delayed setting of the participle movement parameter in Italian and French.

4.2 The Case of Italian and French

It has been shown (for example by Wexler (1998)) that, when syntactically significant production begins in child grammar, major parameters have already been set to the target-consistent values. However, in recent research (Rizzi (2002), Chierchia (2000)), it has been argued that such very early parameter setting might not hold across the board, and that in certain cases a delayed fixation of parameters may occur. Such cases include the parameters controlling determiner omission, copula omission, or root infinitives. We want to claim that, in Italian and French, the nature of the adult input that children receive is such that it results in delayed fixation of the participle movement parameter.

4.2.1 The Nature of the Input

Table 10 illustrates the input that the children acquiring the various languages under investigation receive.

Language	Aux^Participle	Aux^XP^n^Participle
Spanish	100% (285/285)	0% (0/285)
German	3.7% (9/245)	96.3% (236/245)
Italian	89.6% (95/106)	10.4% (11/106)
French	85% (408/480)	15% (72/480)

Table 10: Adjacency of Auxiliary and Participle in Present Perfect Constructions (Adult Input)[3]

Consider first the Spanish data. In virtually all of the present perfect constructions, the auxiliary and the participle appear directly adjacent to one another.

In the German input data about 96% of the utterances show lexical material intervening between the auxiliary and the participle.

In the Italian and French adult input, the scenario is less straightforward. Children are exposed to utterances in which the auxiliary and the participle appear directly adjacent to one another, as well utterances in which they are non-contiguous. More specifically, less than 10-15% of the utterances contain intervening material.

Given these input patterns, how do the Italian- and French-speaking children decide how to fix the participle movement parameter?

4.2.2 Fixing of the Participle Movement Parameter

Based on learnability considerations, such as the Subset Principle (see Berwick (1985), Manzini and Wexler (1986)), let us assume that children select as a default

[3] These percentages were calculated based on quantitative analyses of adult input excerpts from the CHILDES corpora listed in Table 2.

parameter setting the most restrictive option available to them. In the case of participle movement, the most restrictive choice is that of "overt" participle movement. Hence, we propose that children choose such option as the default. This default setting of the parameter may then be reconsidered by the child, but only if counter evidence in the form of non-contiguous aux-participle form is attested in the adult input. Given the input patterns for the various languages that we have seen in Table 10, the predictions are as follows.

In child Spanish, no counter evidence against the default value of "overt" participle movement is found in the input. Therefore, the initial default value of the parameter will be maintained.

In child German, the default setting of the parameter is proven to be wrong by 96% of the utterances in the input. This leads to a re-setting of the parameter to the "covert" value before relevant production begins.

In child Italian and French, counter evidence against the default parameter value is attested as well. However, we want to claim that the evidence in the input of these languages is *so* scarce that a delay in the correct or target-like setting of the parameter is expected.

Since there clearly exists some evidence against the default overt parameter setting, namely from the 8-27% non-contiguous aux-participle forms, the Italian and French children, like the German children, do not maintain the participle movement parameter at its default value. However, given the scarcity of negative evidence in these languages, the Italian and French children, contrary to the German children, are not able to set the parameter to its target-consistent value either. Instead, the participle movement parameter remains unfixed during this period of acquisition. In the Italian and French children, this non-fixation of the parameter gives them the possibility to apply both values of the parameter, overt movement as well as covert movement of the participle. Even though the input cues that drive the target-like setting of the parameter are rare, they eventually will prove to be enough for the children to adjust the participle movement parameter to the target-consistent "covert" value. During the stage of acquisition under investigation here, though, the parameter setting possibilities for the Italian and French children are "overt" as well as "covert."

With these assumptions concerning the value of the participle movement parameter in child Italian and French at hand, TDUR derives the following scenarios in Table 11.

	T^0	$AgrPrt^0$	Comments
a	[aux participle$_i$]	t_i	Option for overt participle movement to T,incorporation with aux, followed by prohibition of T head-deletion under TDUR, results in a full-fledged present perfect form.
b	~~aux~~	participle	Option for covert participle movement, aux deletion under TDUR, results in a bare participle.

Table 11: S-Structure Scenarios for Italian and French Participial Constructions under TDUR

Scenario (a) is an option in Italian and French. We have seen that overt participle movement to T can apply, by which the auxiliary and the participle form a complex Tense head. TDUR will not delete this complex head, since recoverability of the verbal content would be violated. As a result, a full-fledged present perfect form surfaces. Due to the non-fixation of the participle movement parameter, the participle may also move covertly. Such a scenario is shown in (b). Here, TDUR can delete the auxiliary, because the resulting bare participle ensures recoverability of the verbal content. We therefore correctly derive optional auxiliary omission in child Italian and French.

5. Conclusion

In sum, the analysis that we have proposed shows that the interaction of a universal principle that applies in child language, TDUR, and the language-specific properties, namely the setting of the participle movement parameter, accounts for

(i) the difference between child and adult language in terms of auxiliary omission and

(ii) the newly discovered differences between various child languages in terms of auxiliary omission.

In addition, we suggested that it is reasonable to assume a delay in parameter fixation if the input available to the learner is unclear. By this, we are able to account not only for an obligatory auxiliary omission in the participial constructions of child German, and a complete lack thereof in the participial constructions of child Spanish, but also for the optionality of auxiliary omission in child Italian and French.

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Scope Relations of QP's and Scrambling in the Acquisition of Japanese*

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1. Introduction

In this paper, I investigate children's acquisition of scope relations of QP's in Japanese and point out its implications for the variation of scope relations of QP's and for whether A-chains are available at the early stages of child language acquisition. I will show that the acquisition of scope relations of QP's in Japanese does not obey the Subset Principle (Berwick 1985, Wexler and Manzini 1987) and suggest that the acquisition of scope relations of QP's is lexical. I will also show that clause-internal scrambling does not change the scope relation of QP's in early child Japanese, and speculate that A-chain formation in clause-internal scrambling undergoes maturation.

2. Scope Relations of QP's in English and Japanese and Issues in Language Acquisition

It has been pointed out in May (1977, 1985) and others that an English SVO sentence such as (1), with two quantifiers, is ambiguous. That is, either *someone* in the subject position or *everyone* in the object position can take the wide scope in (1).

(1) Someone loves everyone.
   a. "There is a person x, such that, for every person y, x loves y." (∃>∀)
      or
   b. "For every person y, there is a person x, such that x loves y." (∀>∃).

We assume that quantifiers undergo Quantifier Raising (QR) at LF to take scope. The scope relations in (1) are represented as in (1'), following May (1977).

(1') a. $[_{IP}$ someone$_1$ $[_{IP}$ everyone$_2$ $[_{IP}$ t_1 $[_{VP}$ loves $t_2]]]]$. (linear scope)
   b. $[_{IP}$ everyone$_1$ $[_{IP}$ someone$_2$ $[_{IP}$ t_2 $[_{VP}$ loves $t_1]]]]$. (inverse scope)

(1'a) corresponds to the meaning in (1a), and (1'b) corresponds to the meaning in (1b). Thus, the scope ambiguity of an English sentence (1) is captured by the configurations created by QR.

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2.1 The Ban on Inverse Scope in Japanese

In contrast, a Japanese SOV sentence (2), with two quantifiers, is unambiguous with respect to the scope relation (Kuroda 1970, Kuno 1973, Hoji 1985).

(2) Dareka-ga daremo-o aisite iru.
someone-Nom everyone-Acc love
"Someone loves everyone"
a. "There is a person x, such that, for every person y, x loves y." (∃>∀)
(linear scope)
but NOT
b. "For every person y, there is a person x, such that x loves y." (*∀>∃)
(inverse scope)

This observation is accounted for by the so-called rigidity condition in Huang (1982), Hoji (1985), and Lasnik and Saito (1992). Here again, we assume that the quantifiers in (2) can undergo QR and that (2) could result in two LF representations, as shown in (2').

(2') a. $[_{IP}$ dareka$_1$ $[_{IP}$ daremo$_2$ $[_{IP}$ t_1 $[_{VP}$ t_2 aisite iru]]]].
b. $[_{IP}$ daremo$_1$ $[_{IP}$ dareka$_2$ $[_{IP}$ t_2 $[_{VP}$ t_1 aisite iru]]]].

In addition, we assume that (2) is subject to the rigidity condition in (3).

(3) Suppose that Q_1 and Q_2 are operators (quantified NP or WH). Then, Q_1 cannot take wide scope over Q_2 if t_2 c-commands t_1 (where t_1 and t_2 are variables). (Lasnik and Saito 1992, Murasugi and Saito 1992)

(2b) is impossible due to the rigidity condition, and hence, (2a) is the only good LF representation of (2). We account for the unambiguity of (2) in this way. A more difficult question – why is (1) not subject to the rigidity condition? – is put aside here but we will come back to the point later.

As we have just seen, inverse scope is impossible in the example (2) in Japanese, unlike in the example (1) in English. How do Japanese-speaking children acquire this knowledge? On the one hand, it is unlikely that the knowledge is learned from experience only, since it is negative knowledge and negative evidence is not likely to be available, especially for abstract knowledge such as scope. On the other hand, the ban on inverse scope cannot be totally innate, since inverse scope is possible in languages such as English. A possible way out of this dilemma is to hypothesize that inverse scope is banned as an innately-determined default and that it becomes possible only when it is allowed in the target language. In order to examine the empirical validity of this hypothesis, it is instructive to observe Japanese-speaking children's knowledge of inverse scope. Thus, we can state our first issue in this paper as in (4).

(4) Do Japanese-speaking children know that inverse scope is impossible in (2) from early on? (i.e., from the earliest stage for which we can observe relevant properties?)

To my knowledge, this issue has not been addressed in L1 acquisition of Japanese, although Marsden (2003) reports some experimental observations regarding L2 acquisition of Japanese. I will later address this issue with empirical observations on child Japanese.

2.2 Scrambling and Scope Relations of QP's

In Japanese, there is another peculiar phenomenon in scopal relations. A Japanese scrambled OSV sentence with two quantifiers, such as (5), is ambiguous; either quantifier can take the wide scope in (5), as observed in Kuroda (1970) and Hoji (1985).

(5) Daremo-o$_i$ dareka-ga t_i aisite iru. ($\exists>\forall$, $\forall>\exists$))
everyone-Acc someone-Nom loves
"Everyone, someone loves."
a. "There is a person x, such that, for every person y, x loves y." ($\exists>\forall$)
or
b. "For every person y, there is a person x, such that x loves y." ($\forall>\exists$)

After undergoing QR, (5) would result in two representations, as in (5').

(5') a. [dareka$_1$ [daremo$_2$ [t_1 [t_2 aisite iru]]]].
b. [daremo$_1$ [dareka$_2$ [t_2 [t_1 aisite iru]]]].

(5'a), which represents the meaning in (5a), is not a problem for the rigidity condition. But in (5'b), which represents the meaning in (5b), the trace of *daremo*, t_1, is asymmetrically c-commanded by the trace of *dareka*, t_2. Hence, (5'b) appears to be impossible due to the rigidity condition in (3), and if so, *daremo* should not be able to take the wide scope in (5). But in fact, the wide scope reading of *daremo* in (5) is very easily available.

Murasugi and Saito (1992) argue that (5) is not a problem for the rigidity condition in (3). They claim that only variables are subject to the rigidity condition, and account for the ambiguity in (5) by taking advantage of the well-established consensus that clause-internal scrambling can be A-movement, as well as A'-movement (Mahajan 1990, Saito 1992).

Let us here briefly take a look at the evidence that clause-internal scrambling can be A-movement. First, Yoshimura (1989, 1992) observes that clause-internal scrambling does not yield a weak crossover (WCO) violation in Japanese, as in (6b).

(6) a. ?*Soitu$_i$-no hahaoya-ga dare$_i$-o aisite iru no?
the guy-Gen mother-Nom who-Acc love Q
"His$_i$ mother loves who$_i$."

b. ?Dare$_i$-o soitu$_i$-no hahaoya-ga t_i aisite iru no?
who-Acc the guy-Gen mother-Nom love Q
"Who$_i$, his$_i$ mother loves t_i."

(6a) is a case of standard WCO violation. In (6b), where the object phrase is scrambled, no WCO violation is observed. This indicates that clause-internal scrambling can be A-movement, because, as is well-known, A-movement remedies a WCO violation, as in (7).

(7) Who$_i$ [t_i seems to his$_i$ mother [t_i to be intelligent]]?

Thus, Yoshimura (1992) argues that the lack of the WCO effect in (6b) shows that Japanese clause-internal scrambling can be A-movement.

Second, Saito (1992) points out that a reciprocal anaphor *otagai* 'each other' can be bound by a clause-internally scrambled phrase in Japanese, as in (8b).

(8) a. ?*Otagai$_i$-no sensei-ga karera$_i$-o hihansita.
each other Gen teacher-Nom they-Acc criticized
"Each other's$_i$ teachers criticized them$_i$."
b. ?Karera$_i$-o otagai$_i$-no sensei-ga t_i hihansita.
they-Acc each other-Gen teacher-Nom criticized
"Them$_i$, each other's$_i$ teachers criticized t_i."

According to Binding Condition A in Chomksy (1981), an anaphor must be locally bound by its antecedent in an A-position. Then, the well-formedness of (8b) indicates that a phrase preposed by clause-internal scrambling is in an A-position. This means, again, that Japanese clause-internal scrambling can be A-movement.

In this way, it has been agreed that clause-internal scrambling can be A-movement in Japanese. However, as shown in Saito (1992), there is other evidence showing that Japanese clause-internal scrambling can be A'-movement as well. To be specific, the scrambled phrase in the following grammatical example should not be in an A-position, to avoid violation of Binding Condition C; rather, it must be in an A'-position.

(9) Zibunzisin-o$_i$ Hanako-ga t_i hihansita.
self -Acc -Nom crititized
"Herself$_i$, Hanako criticized t_i."

Thus, clause-internal scrambling in Japanese is ambiguous between A-movement and A'-movement.

Given that Japanese clause-internal scrambling can be A-movement, its trace can be an NP-trace, and not necessarily a variable. Keeping this in mind, let us get back to the scope ambiguity of a scrambled Japanese sentence, such as the example in (5). Take a look at the LF representations of (5) after QR, namely (5'a) and (5'b). Earlier, we wondered if (5'b) is impossible due to the rigidity condition (3), as the trace of *daremo*, t_1, is asymmetrically c-commanded by the trace of *dareka*, t_2, in (5'b). Now, notice that t_1 in (5'b) is a trace of clause-internal scrambling, hence

it can be an NP-trace. Then, (5'b) is not ruled out by the rigidity condition, as only variables are subject to the rigidity condition. This is how Murasugi and Saito (1992) handle the ambiguity of (5) while explaining the unambiguity of (2) by the rigidity condition.

The discussion so far implies that the scope change of QP's should not occur when the trace left by scrambling is a variable, in other words, when scrambling is A'-movement. The validity of this implication can be empirically examined with long-distance scrambling. It is again quite well-established that Japanese long-distance scrambling is purely A'-movement (Saito 1992, cf. Yoshimura 1989, 1992). Saito (1992) observes that a phrase preposed by long-distance scrambling cannot bind an anaphor *otagai* 'each other', as in (10).

(10) a. *Masao-ga otagai$_i$-no sensei-ni [Hanako-ga karera$_i$-o hihansita to] itta.
-Nom each other-Gen teacher-to –Nom they-Acc criticized that said
"Masao said to each other$_i$'s teachers that Hanako criticized them$_i$"
b. *Karera$_i$-o [Masao-ga otagai$_i$-no sensei-ni [Hanako-ga t_i hihansita to] itta].
they-Acc -Nom each other-Gen teacher-to -Nom criticized that said
"Them$_i$, Masao said to each other$_i$'s teachers that Hanako criticized t_i."

(10b) is as bad as (10a). This indicates that the landing site of long-distance scrambling is an A'-position, unlike the case of clause-internal scrambling.

Given this, let us see if the scope relation of QP's changes by long-distance scrambling or not. Tada (1993) observes that long-distance scrambling does not change the scope relation of QP's, while clause-internal scrambling does. Thus, (11) and (12) are the same regarding scope relation; they both lack inverse scope.

(11) Dareka-ga [John-ga daremo-o aisite iru to] omotte iru. (∃>∀, *∀>∃)
someone-Nom -Nom everyone-Acc loves that thinks
"Someone thinks that John loves everyone."
(12) Daremo$_i$-o dareka-ga [John-ga t_i aisite iru to] omotte iru. (∃>∀, *∀>∃)
everyone-Acc someone-Nom -Nom loves that thinks
"Everyone, someone thinks that John loves."

The lack of inverse scope in (12) follows from the rigidity condition because long-distance scrambling is A'-movement and hence the trace of long-distance scrambling is a variable.

In this way, whether scope relation changes by scrambling or not depends on whether the scrambling in question is A-movement or A'-movement. We have seen that clause-internal scrambling, which can be A-movement, changes the scope relations of QP's, while long-distance scrambling, which is purely A'-movement, does not change scope relations.

Incidentally, there is a debate on whether A-chains are available in the early stages of child language acquisition. Borer and Wexler (1987, 1992) and Babyonyshev et al. (2001) claim that there is an early stage in child language acquisition where A-chains are unavailable because of immaturity. This is called the A-chain Maturation Hypothesis. In this connection, it would be interesting to see if Japanese-speaking children are able to form an A-chain in clause-internal

scrambling. Thus, here we introduce our second issue of this paper.

(13) Do Japanese-speaking children change scope relations by clause-internal scrambling? In other words, do they know that either quantifier can take the wide scope in (5) while (2) is unambiguous?

If the answer for (13) is "yes" for a child, then clause-internal scrambling can be A-movement for the child. Thus, by observing whether Japanese-speaking children change scope relations by clause-internal scrambling, we can evaluate the A-chain Maturation Hypothesis.

We have so far raised two questions on the acquisition of scope relations by Japanese-speaking children. A comprehension experiment was carried out to find answers to these questions.

3. Experiment

In the experiment, 20 monolingual Japanese-speaking children children (age 4;1-6;5) in the Tokyo area were examined. Also, 10 adult Japanese non-linguists were tested as controls. The method of the experiment was in the format of the Truth-Value Judgment Task (Crain and Thornton 1998). An experimenter narrated a story while showing a series of pictures. At the end of each story, another experimenter, who was pretending to be a Pikachu puppet, gave a Japanese sentence to describe what was going on in the final picture. The child's task was to judge whether the puppet's description of the picture was right or wrong by either feeding a candy or giving a stone to the puppet. Each child was interviewed individually in a quiet room.

Before the main session, there was a pretest session which investigated the subject's knowledge of a Japanese universal quantifier. The stimulus sentence in the pretest session was (14).

(14) Dono neko mo hata-o motte iru.
Every cat flag-Acc holding
"Every cat is holding a flag."

(14) was given for matching and mismatching pictures. In the matching picture, there are three cats and each cat is holding a flag. In the mismatching picture, there are three cats and three flags; the first cat is holding a flag, so is the second cat, but the third cat is not holding a flag and a flag is on the ground. The task was to accept the matching case and reject the mismatching case. None of the 10 adult controls had a problem in the pretest. 20 children passed this pretest and only two kids were excluded by failing in the pretest.

In each trial of the main session, a series of three pictures was shown to each child and a puppet described the final picture with a Japanese sentence. In the first picture for all trials, there are three cats and four kids; the faces of three of the kids are visible and their names are given in narration (e.g., Taro, Hanako, Jiro), while the face of the fourth kid is invisible and the experimenter says that his name is unknown.

In one scenario, the nameless child ends up catching all three cats (i.e., the ∃>∀ situation). This can be described by either the canonical SOV sentence (15) or the scrambled OSV sentence (16).

(15) Dareka-ga dono neko mo tukamaeta. (Canonical SOV) (∃>∀, *∀>∃)
someone-Nom every cat caught
"Someone caught every cat."

(16) Dono neko mo$_i$ dareka-ga t_i tukamaeta. (Scrambled OSV) (∃>∀, ∀>∃)
every cat someone-Nom caught
"Every cat, someone caught."

In the other scenario, each of the three kids with names ends up catching a cat (i.e., the ∀>∃ situation). This can be described by (16) but not by (15). The child's task was to accept both (15) and (16) for the ∃>∀ situation, and reject (15) but accept (16) for the ∀>∃ situation.

The correct response rates of the main session are given in (17).

(17)

	A	B	C	D
Situation	∃>∀	∃>∀	∀>∃	∀>∃
Sentence	(15)	(16)	(15)	(16)
right answer	accept	accept	reject	accept
Children (4;1-6;5)	18/20 (90%)	15/20 (75%)	6/20 (30%)	14/20 (70%)
Adult Control	10/10 (100%)	10/10 (100%)	8/10 (80%)	10/10 (100%)

First, let us examine whether Japanese-speaking children know that inverse scope is impossible in a canonical SOV sentence like (15). To see this, take a look at column C in (17), which represents the correct response rate of rejecting (15) for the ∀>∃ situation. Children's correct response rate is only 30%, as opposed to 80% for the adult controls (see Marsden (2003) for similar results on adult controls). This indicates that young Japanese-speaking children do not know that sentences with the canonical SOV order cannot have inverse scope. This applies even to the group of 6-year-olds (N=5), as their correct response rate for the case C in table (17) is only 2/5 (40%).

The second issue of this paper is to investigate whether young Japanese-speaking children change the scope relations of QP's in clause-internal scrambling. For this, take a look at column D in (17), which represents the correct response rate of accepting (16) for the ∀>∃ situation. The children's correct response rate for D is 70%. This is quite high, especially if we consider that a scrambled OSV sentence is more difficult for young children than a canonical SOV sentence (Hayashibe 1975, cf. Otsu 1994). However, it is hasty to conclude from this data that Japanese children know that clause-internal scrambling changes scope relation. To be more precise, we need to examine whether a child who succeeds in rejecting (15) for the ∀>∃ situation also succeeds in accepting (16) for the same situation.

The result of the subject-by-subject analysis for the cases C and D is as follows.

There are 6 kids who correctly rejected the sentence (15) for the ∀>∃ situation. Out of the 6 kids, 5 kids rejected the sentence (16) for the ∀>∃ situation (5/6=83%). This is in sharp contrast to the response pattern of the rest of the subjects. There are 14 kids who wrongly accepted sentence (15) for the ∀>∃ situation. Out of the 14 kids, only 1 kid rejected sentence (16) for the ∀>∃ situation (1/14=7%). Thus, almost all of the Japanese kids (18 out of 20) do not change the scope relations of QP's due to scrambling, unlike adults. That is, Japanese kids do not know the difference between (15) and (16) regarding scope relations.

Thus, we have got negative answers to the two questions raised in this paper. Below, we will attempt to discuss theoretical implications of these results.

4. Late Acquisition of the Ban on Inverse Scope

Let us first discuss the issue in (4). The issue is whether Japanese-speaking children know that inverse scope is impossible in a canonical SOV sentence like (2) from a very early stage of development. This issue has to do with the learnability of the ban on inverse scope. A language where a sentence equivalent to (2) allows inverse scope (i.e., adult English) is a superset of a language where a sentence equivalent to (2) disallows inverse scope. (i.e., adult Japanese). In other words, such two languages are in a subset relation. Therefore, if a child first assumes that inverse scope is possible, then the child cannot change the grammar and begin to disallow inverse scope later, as long as the child receives positive evidence only. To make such a change in the grammar, negative evidence would be necessary, but negative evidence is not likely to be available to children (Brown and Hanlon 1970, Marcus 1993).

A way to solve this learnability problem is to assume that children obey the Subset Principle proposed in Berwick (1985) and Wexler and Manzini (1987). The Subset Principle can be defined as in (18).

(18) In language acquisition, always choose a grammar which generates a language:
(a) compatible with the input data; and
(b) smallest among the languages compatible with the input data
(see Wexler and Manzini 1987)

According to the Subset Principle, the child chooses a grammar which bans the inverse scope unless the child receives positive evidence that the target language allows the inverse scope. Thus, the Subset Principle predicts that a child acquiring Japanese continuously disallows the inverse scope since adult Japanese disallows it.

However, we have observed that Japanese-speaking children wrongly allow the inverse scope in a canonical SOV sentence. Hence, our data go against the idea that children obey the Subset Principle in the acquisition of the ban on inverse scope.

Our observation on the wrong inverse scope in early child Japanese is rather compatible with a view that whether inverse scope is possible or not is determined by lexical factors. There are some observations which suggest that this lexical account is on the right track. For instance, when the quantifier in the object position is *all*, as in (19), it is pointed out that there is decrease in the availability of inverse scope (Ioup 1975, Marsden 2003).

(19) Someone read all the books.
a. "There is x, such that, for all y, y a book, x read y." (∃>∀)
b. ??/*"For all y, y a book, there is an x, such that x read y." (??/*∀>∃)

According to this lexical view, our data in early child Japanese can be understood in the following way. In canonical SVO or SOV sentences, some quantifiers allow the inverse scope in scope relations and others do not, and it appears that it takes quite a while for children to identify which lexical item belongs to which class. Thus, I speculate that Japanese-speaking children's wrong assignment of inverse scope arises from delay in the identification of quantificational lexical items. This implies that the difference regarding scope between an English example in (1) and its corresponding Japanese example (2) should also be traced to a difference in the lexical identity of quantifiers. It also implies that Japanese universal quantifiers such as *daremo* or *dono N mo* are like English *every* in child Japanese, and they are like English *all* in adult Japanese. The exact nature of the lexical status of each quantifier is a further issue and left open here.

5. Scope Relations and the Acquisition of Scrambling

Let us next discuss the issue in (13). The issue is whether Japanese-speaking children change the scope relations of QP's by clause-internal scrambling. In section 3, it was pointed out that almost all of the Japanese children did not change the scope relations of QP's by clause-internal scrambling. As discussed in section 2, clause-internal scrambling, which is ambiguous between A-movement and A'-movement, may change the scope relations of QP's, while long-distance scrambling, which is purely A'-movement, does not change scope relations. Therefore, our experimental observation suggests that clause-internal scrambling in early child Japanese is purely A'-movement, just like long-distance scrambling in adult Japanese. In other words, clause-internal scrambling lacks the property of A-movement in early child Japanese, while it has properties of both A-movement and A'-movement in adult Japanese. This is another instance where an A-chain is not available in early child language, and it might be interpreted as support for the A-chain Maturation Hypothesis.

However, the A-chain Maturation Hypothesis has been argued against in Fox and Grodzinsky (1998) and there are some pieces of evidence against A-chain Maturation in Japanese acquisition in Sano et al. (2001) and Okabe and Sano (2002). To take an example in child Japanese, Sano et al. (2001) report that children at the age of 4 and 5 are significantly better at full unaccusatives such as (20b) than at full passives such as (20a).

(20) a. Buta-san-ga zou-san ni tukamae-rare-ta. [Full passive]
pig Nom elephant by catch-Pass-Past
"The pig was caught by the elephant."
b. Buta-san-ga zou-san ni tukamat-ta. [Full unaccusative]
pig Nom elephant by catch(Unacc)-Past
"The pig was caught by the elephant."

Both of them involve an A-chain between the subject position and the object position, as shown by the Q-float test. Hence, the late development of Japanese full passives such as (20a) cannot be accounted for by the A-chain Maturation Hypothesis and it should rather be attributed to the late development of theta-transmission, as argued in Fox and Grodzinksy (1998).

Then, how can we capture the unavailability of an A-chain in clause-internal scrambling in early child Japanese, without having recourse to the A-chain Maturation Hypothesis? If we have been right so far, at the early stage of language development, A-chains are available for passives and unaccusatives, but are unavailable for clause-internal scrambling. Here, note that passives and unaccusatives are pure A-movement, while clause-internal scrambling is ambiguous between A-movement and A'-movement, as shown in Saito (1992). Thus, I tentatively offer a hypothesis such as the following.

(21) Limited A-chain Maturation Hypothesis
A-chain undergoes maturation in language development where a dependency is ambiguous between A'-chain and A-chain.

At this point, I don't have an idea about why A-chain maturation is limited in such a way. If this speculation is valid, I hope to find a deeper explanation for it, but here I leave the matter open.

6. Conclusion

I have done two things in this paper. One is to show that Japanese-speaking children at first allow inverse scope in SOV sentences such as (2), unlike adults. I attributed this to the delay in lexical identification of quantifiers. The other is to observe that Japanese-speaking children at first do not change scope relations in scrambled OSV sentences such as (5), unlike adults. I argued that this is because clause-internal scrambling can be only A'-movement for young children. Whether these observations are valid or not remain to be confirmed by further investigation.

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How Do Children Say "Yes" in European Portuguese?

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1. Introduction

This paper provides some preliminary findings of a project concerning the acquisition of answer patterns to yes-no questions in European Portuguese (EP). It is argued that the acquisition of these answer patterns provides evidence for language modularity: the relevant modules are syntax, discourse and pragmatics. More specifically, it will be shown that the syntactic availability of different answer patterns in EP is not coincident with the emergence of certain discourse and pragmatic abilities involved in the adult usage of these answers. The data on the acquisition of answers to yes-no questions in EP are also shown to be evidence for (i) the early availability of the notion of Topic, (ii) the early availability of VP ellipsis and (iii) early difficulty in dealing with prosodic and discourse cues that allow a yes-no question to be interpreted as a confirmation request.

1.1 Types of answers to yes-no questions in European Portuguese

In EP there are four main types of answer to yes-no questions: *Sim* (yes) answers, verbal answers (which recover a form of the verb in the question), *Ser* (Be) answers (which use a frozen form of the verb *Ser* / Be) and adverbial answers. The latter type of answer is restricted to cases where certain adverbs (e.g. *já* / *already*, *só* / *only*, *também* / *also*) occur in the question.

(1) Q: Ele já encontrou a chave?
he already found[3rd sg] the key
"Has he already found the key?"

A: a. Sim. – *Sim (yes) answer*
Yes

b. Encontrou. – *verbal answer*
found[3rd sg]

c. É. / Foi. – *Ser (Be) answer*
is / was

d. Já. – *adverbial answer*
already

This paper focuses on verbal, *Ser* (Be) and *Sim* (yes) answers. First, I will present arguments that set apart the different types of answer patterns and then turn to the discussion of data from the acquisition of these different answer patterns.

2. Arguments for the different status of the different types of answer

In this section, the three answer patterns considered here are syntactically and pragmatically distinguished.

2.1 *Sim* (yes) answers and *Ser* (Be) answers are not syntactically equivalent to verbal answers

The following facts support the claim that *Sim* (yes) and *Ser* (Be) answers are not syntactically equivalent to verbal answers:

a. A focalization operator in preverbal position precludes verbal answers, whereas *Sim* (yes) or *Ser* (Be) answers remain available.

(2) Q: Só o João estudou Geografia?
only the João studied[3rd sg] Geography
"Did only João study Geography?"
A: Sim. / Foi. / É. / Só. / *Estudou.
yes / was / is / only / studied[3rd sg]

The material focused in this question (the 'aim' of the question) is interpreted as coincident with the material in the scope of *só* (only). If *só* (only) and its scope are outside the c-command domain of the verb, the verbal answer turns out to be impossible. Note that the presence of *só* (only) does not necessarily block a verbal answer. This type of answer remains available if the focus of the question is included in the c-command domain of the verb, even if it does not coincide with it:

(3) Q: Ele encontrou só a chave?
he found only the key
"Has he only found the key?"
A: Sim./ É. / Encontrou. /Só.
yes is found only

Yes-no questions involving clefts provide evidence that c-command of the focused material in the question is indeed related to the choice of answer (cf. 4). If we assume that the question in (4) has the structure presented in (5), following the analysis of clefts in Costa and Duarte (2001), it becomes clear that a verbal answer is restricted to those cases where the verb recovered in the answer c-commands the focused DP (in this case, $[_{DP}$ a chave]) in the corresponding question.

(4) Q: O que o João encontrou foi a chave?
what the João found was the key
"Was it the key that João found?"
A: Sim. / É. / *Encontrou. / Foi.
yes is found was

(5) $[_{IP}\ [_{CP}$ O que o João encontrou$]_i$ foi $[_{SC}\ t_i\ [_{DP}$ a chave]]]

b. A verbal answer may be unavailable in certain discourse environments, namely sentence-focus contexts

Given the discourse context in (6), the question must receive a sentence-focus interpretation. In this case, most EP speakers prefer *Sim* (yes) or *Ser* (Be) answers. Verbal answers are thus excluded when the focused material (the sentence) is not in the c-command domain of the verb.

(6) A: O que é que aconteceu? A Teresa desmaiou?
what is that happened the Teresa fainted
"What happened? Has Teresa fainted?"
B: Foi. / Sim. / #Desmaiou.
was yes fainted

Confirmation contexts are also contexts where sentence-focus readings may obtain. The confirmation question uttered by Speaker A in (7) may receive two different interpretations:
- interpretation 1: Speaker A thinks it is strange that the little duck has a friend and asks the question to confirm that the little duck has a friend (is it true about x, x being the little duck, that x has a friend?). In this case, a verbal answer is available.
- interpretation 2: Speaker A is not sure about what has been said by speaker B and asks the question to confirm what was said (is it true about x, x being what you said, that x = the little duck has a friend?). In this case, the focus of the question is the all proposition, i.e., it is a case of sentence-focus reading. In this case, the verbal answer is not available.

(7) Speaker B: O patinho tem um amigo.
the little duck has a friend
"The little duck has a friend."
Speaker A: O patinho tem um amigo?
the little duck has a friend
"Does the little duck have a friend?"
Speaker B: Sim. / É / Tem.
yes is has

These facts indicate that the choice of answer to a yes-no question in EP depends on what material is focused in the question. In other words, it depends on the information structure of the question, since the material focused in a yes-no question must be recovered by the answer.

Particularly, a verbal answer is available whenever the material focused in the question is under the scope of V or coincides with V and its scope. If one makes a classic assumption that scope relations are defined under c-command and that the material recovered in an answer is the material in the scope of the only lexically realized item in the answer, the difference between verbal answers on the one hand and *Sim* (yes) and *Ser* (Be) answers on the other should correspond to a syntactic difference, a scope difference: *Sim* (yes) and *Ser* (Be) must occupy a position structurally higher than the position occupied by the verb in a verbal answer in order

to recover higher material. Therefore, I will assume that verbal answers are instances of VP ellipsis (following Martins 1994). Moreover, I will assume that the verb in VP ellipsis (and in verbal answers) is in T (against Martins 1994 and in agreement with Matos 1992, and Cyrino and Matos 2002 and with the general idea of short verb movement in Portuguese argued for in Costa 1996). A verbal answer is then possible when the focused material in the question coincides with TP or is under the scope of T. Assuming (8) is the basic syntactic structure for EP sentences,

(8) $[_{\Sigma P}\ \Sigma\ [_{AgrSP}\ AgrS\ [_{TP}\ T\ [_{VP}\ V\ [\ ...\ ]\ ]]\ ]]$

Sim and *Ser* may occupy a high left peripheral position, for instance Σ - this explains why *Sim* and *Ser* answers qualify as answers to questions in which the preverbal subject (which raises to Spec, AgrS) is focused.

These data also link verbal answers to the default interpretation of yes-no questions. In order to define what the default interpretation of a yes-no question is, I will assume with Reinhart (1982) that the two procedures of assessing and storing information are relativized to topics. Reinhart elaborates on Strawson (1971: 93) definition of topics: "[...] assessments of statements as true or untrue are commonly, though not only, topic-centred in the same way as the statements assessed; and when, as commonly, this is so, we may say that the statement is assessed *as* putative information *about its topic*." By default, a yes-no question is interpreted as a request to assess all the presented information about a given topic. This explains why SVO yes-no questions typically receive a default interpretation, where the preverbal subject is interpreted as a topic (cf. Duarte 1987). This happens unless something else forces the interpretation of the subject as Focus (cf. cases where the subject is under the scope of *só* / *only*) or part of the Focus (sentence-focus readings).

2.2 *Sim* (yes) and *Ser* (Be) are not exactly equivalent answers: there are pragmatic and discourse distinctions that affect the distribution of both types of answer

Although *Sim* (yes) and *Ser* (Be) answers seem to have the same syntactic status, they do not have the same pragmatic or discourse value. Namely, *Ser* (Be) answers are not available as agreement answers to indirect requests / invitations.

(9) Q: Podes fechar a janela?
could[2nd sg] close the window
"Could you close the window?"
A: Sim. / #É. / Posso.
yes / is / can[1st sg]

(10) Q: Vamos tomar café?
go[1st pl] take coffee
"Shall we have coffee?"
A: Sim. / #É. / Vamos.
yes / is / go[1st pl]

Moreover, *Ser* (Be) answers are felt by EP speakers to be especially adequate answers to questions in confirmation contexts. Some speakers only accept *Ser* (Be) answers in confirmation contexts.

3. How do children say *yes* in European Portuguese?

The fact that EP presents several different answer patterns to yes-no questions raises interesting questions, namely:
a. Do the syntactic differences between the different types of minimal answer have consequences for the acquisition process?
b. Are the pragmatic and discourse differences between *Sim* (yes) and *Ser* (Be) answers reflected in the acquisition process?

I will consider the spontaneous production of two monolingual children acquiring European Portuguese. The data were transcribed using the CHAT format (MacWhinney and Snow 1985)[1]. Each file corresponds to the complete transcription of one session of videotaping (45-50 minutes of recording).

Child	Age range	Number of files
Inês	1;6.6-3;11.12	21
Tomás	1;6.18-2;3.9	10

Table 1

3.1 Stages in the acquisition of minimal answers

The results presented for Inês in Table 2 show that this child does not produce *Sim* (yes) and *Ser* (Be) answers in the earliest sessions. If we consider Inês' data, we are able to identify three stages: at Stage I only verbal answers are available; at Stage II low percentages of other answers emerge and the number of *Ser* (Be) answers increases; at Stage III, the number of *Sim* (yes) answers increases and the number of *Ser* (Be) answers decreases.

	Stage I 1;6.6 – 1;8.2	Stage II 1;9.19 – 2;1.10	Stage III 2;2.1 – 3;11.12
Verbal answer	100% (12/12)	85,5% (71/83)	59,4% (138/232)
Sim (yes) answer	0	3,6% (3/83)	34% (79/232)
Ser (Be) answer	0	8,4% (7/83)	2,5% (6/232)
Adverbial answer	0	2,4% (2/83)	3,8% (9/232)

Table 2 - Acquisition of minimal answers in Inês' data

[1] Inês was videotaped by Maria João Freitas for her PhD research (cf. Freitas 1997) and for the project PCSH/C/LIN/524/93 developed at Laboratório de Psicolinguística da Faculdade de Letras da Universidade de Lisboa. The first sessions of Inês were partially transcribed by Maria João Freitas and completed by myself, whereas later sessions were transcribed by Teresa Costa and myself. Tomás was videotaped and transcribed by myself.

With respect to the second child, the data from all the sessions considered here seem to correspond to Stage II in Inês' data: all the answer patterns are available, although *Ser* (Be) answers outnumber *Sim* (yes) answers.

	(Stage II) 1;6.18 – 2;3.8
Verbal answer	74% (205/277)
sim (yes) answer	2,1% (6/277)
Ser (Be) answer	21,6% (60/277)
Adverbial answer	2,1% (6/277)

Table 3 - Acquisition of minimal answers in Tomás' data

3.2 What does early availability of verbal answers mean?

In this section I would like to emphasize the fact that, as far as these data are representative, verbal answers are available from the earliest stages on. This fact has interesting consequences if we adopt the analysis of verbal answers referred to in section 2.1.

If verbal answers indeed correlate with the default interpretation of a yes-no question, which is a topic-centered interpretation (cf. section 2.1), the ability to produce a verbal answer may mean that children (i) are aware of the default interpretation of yes-no questions, which is a topic-centred interpretation and (ii) are able to correctly identify the topic in a question, namely by interpreting preverbal subjects as topics (De Cat 2002 shows that children acquiring French are able to deal with topics from very early stages on). Example (11) illustrates an early verbal answer in a context of a question with a phonologically realized preverbal subject:

(11) *MAE: eu posso?
I may
"May I?"
*INI: pô [: podes].
may [Inês 1;8.2]

On the other hand, if verbal answers are indeed instances of VP ellipsis, the production of verbal answers may mean that children are able to deal with VP ellipsis from the earliest stages (at least from 1;6) on. Verbal answers may indeed be the only type of evidence that children deal with VP ellipsis at these early stages, since at 1;6 the limitations to the type of structures produced make it difficult to find other VP ellipsis contexts (for instance sentence coordination). Notice that there is evidence that children do treat verbal answers as VP ellipsis and not, for instance, as null objects. Example (12) is a clear-cut of a verbal answer with an elided VP:

(12) *MAE: o cavalo vai papar?
the horse is going to eat
"Is the horse going to eat?"
*TOM: vai.
is going [Tomás, 1;9.14]

The early availability of VP ellipsis is particularly interesting, since ellipsis structures are resolved at the syntax / discourse interface (cf. revision in Winkler and Schwabe 2003); to assume early ability to deal with VP ellipsis in relevant contexts also implies the assumption that at least a certain type of discourse abilities is available from the earliest stages on.

Finally, a note on the later emergence of *Sim* (yes) and *Ser* (Be) answers in Inês data. Notice first that the absence of *Sim* answers may not be due to the absence of adequate contexts, since *Sim* (yes) answers are possible as answers to all types of yes-no questions. If data from other children confirm this pattern, it may be the case that the later emergence of *Sim* (yes) and *Ser* (Be) answers is evidence for the late emergence of a high functional projection associated with these polarity elements (or evidence for late emergence of relevant features in this high functional node).

3.3 More on the acquisition of syntactic and discourse knowledge

Data from first answers to yes-no questions may also raise other interesting questions concerning early discourse abilities. In section 2.2 it was pointed out that *Ser* (Be) answers are felt by EP speakers as especially adequate in confirmation contexts. These contexts include answers to yes-no questions that are confirmation requests. In order to recognise a yes-no question that is a confirmation request, we have to rely on the evaluation of the discourse context (cf. example 14 below) or on the identification of the particular intonation pattern of this type of questions (Mata 1990 shows that these questions bear a specific intonation pattern). In case children use *Ser* (Be) answers more often in confirmation contexts than as answers to "normal" yes-no questions, this would be evidence that they clearly recognise the discourse value of a yes-no question that is a confirmation request and that they can rely either on discourse or on prosodic cues.

For the performance of children in these contexts, I have looked at answers to 'normal' yes-no questions and at two types of confirmation contexts: confirmations of preceding declarative sentences (cf. 13) and answers to yes-no questions that are in fact requests for confirmation (cf. 14).

(13) Speaker A: O João vai ao cinema.
the João goes to+the cinema
"João goes to the cinema."
Speaker B: Sim. / É. / Vai.
yes / is / goes

(14) Speaker B: O João vai ao cinema.
the João goes to+the cinema
"João goes to the cinema."
Speaker A: O João vai ao cinema?
the João goes to+the cinema
"Does João go to the cinema?"
Speaker B: Sim. É. Vai.
yes / is / goes

The following tables provide the percentages of *Ser* (Be) answers in Inês and in Tomás' data. These are coincident in two respects: in Inês' data and in the period between 1;6.18 and 1;11.12 in Tomás' data, (i) the percentage of *Ser* (Be) answers is higher in confirmations of declarative sentences than in confirmations requested through yes-no questions; (ii) *Ser* (Be) answers to yes-no questions that have a confirmative value occur more often than *Ser* (Be) answers to "true" yes-no questions, but they do not reach the percentages for confirmations of preceding declarative sentences.

	1;9.19 – 3;11.12
Conf. Prec. Decl.	12,12% (4 / 33)
Ans. yes-no conf.	4,16% (2/48)
Ans. normal yes-no	3,24% (5/154)

Table 4 - *Ser* (Be) answers in confirmation and other contexts in Inês' data[2]

Abbreviations:
Conf. Prec. Decl. – confirmations of preceding declarative sentences
Ans. yes-no conf. – answers to yes-no questions that are confirmation requests
Ans. normal yes-no – answers to yes-no questions that are not confirmation requests

	1;6.18-1;11.12	2;0.10-2;3.9
Conf. Prec. Decl.	100% (5/5)	72,72% (8/11)
Ans. yes-no conf.	47,05% (8/17)	65,51% (19/29)
Ans. normal yes-no	29,85% (20/67)	29,72% (11/37)

Table 5 - *Ser* (Be) answers in confirmation and other contexts in Tomás' data

Abbreviations: see Table 4.

Although the data presented here are not sufficient to warrant a safe conclusion, this type of results could mean that, although the child understands the specialization of *Ser* (Be) answers as answers to confirmations (*Ser* answers occur more often as confirmations of declarative sentences than in other contexts), he / she is not yet completely able to deal with complex discourse contexts that alter the interpretation of yes-no questions (*Ser* answers show lower percentages in answers to yes-no questions that have the value of a confirmation request than in cases of confirmations of preceding declarative sentences). It could be the case that the child is (in most cases) answering to a yes-no question with the value of a confirmation as if it were a normal yes-no question.

There is indeed some additional evidence supporting the claim that children do not clearly recognize as such questions that are confirmation requests. When

[2] Verbal answers involving the forms *é* (is) or *foi* (was) of the verb *ser* (to be) were not taken into account as verbal answers – these are the forms of the verb *ser* (to be) used in *Ser* (Be) answers - and it could be misleading to consider them here as verbal answers. Notice that the number of *Ser* (Be) answers to yes-no questions in the preceding tables included both answers to yes–no questions that behave as requests for confirmation and answers to "normal" yes-no questions. This table also does not include answers to tags.

answering to a confirmation request, one may use *pois* (in fact), as in (16) and (17). Thus the presence of *pois* in an answer would be clear evidence that the child recognizes the context as a confirmation context.

(16) A: O patinho já tem um amigo.
the little duck already has a friend
"The little duck already has a friend."
B: *Pois sim. / Pois é. / Pois tem. / Pois já. / Pois.
in fact yes in fact is in fact has in fact already in fact

(17) B: O patinho já tem um amigo.
the little duck already has a friend
"The little duck already has a friend."
A: O patinho já tem um amigo?
the little duck already has a friend
"Does the little duck already have a friend?"
B: *Pois sim. / Pois é. / Pois tem. / Pois já. / Pois.
in fact yes in fact is in fact has in fact already in fact

Table 6 shows that the children never use the word *pois* when answering to yes-no questions that are confirmation requests. They also do not commit mistakes using this confirmation word in answers to 'normal' yes-no questions. Interestingly, at least one of the children uses *pois* in answers to tags. Tags are in fact questions that require confirmation, but in the case of tags the confirmation request is marked syntactically.

	Inês	Tomás
Conf. Prec. Decl.	12 (first: 1;10.29)	6 (first: 2;2.9)
Ans. yes-no conf.	0	0
Ans. normal yes-no	0	0
Ans. tags	3 (first: 1;8.2)	0

Table 6

Abbreviations:
Conf. Prec. Decl. – confirmations of preceding declarative sentences
Ans. yes-no conf. – answers to yes-no questions that are confirmation requests
Ans. normal yes-no – answers to yes-no questions that are not confirmation requests
Ans. tags – answers to tag questions

So there is no evidence at this point that children are able to deal with the relevant cues that allow to identify a yes-no question as a confirmation request. As far as the evaluation of the discourse context is concerned, Avrutin (1999: 50) claims that "knowledge of the rules of conversation is different [from syntactic knowledge] in that its implementation relies on speakers' capacity to make inferences about other speakers representations of the conversation". The same author argues that children often fail to establish this type of inferences. The facts presented in this section may be in agreement with this claim, even though the claim has been applied to very different processes: to understand a yes-no question as a confirmation

request (without using intonation as a resource), the child has to infer that if the other speaker asks something that was already answered in previous discourse, he is not asking for new information but asking for a confirmation. Children seem to fail at establishing this type of inference.

Now let us turn to the question concerning the interaction between prosody and syntax. Recall that 'true' yes-no questions present a distinct intonation pattern from yes-no questions with the value of confirmation requests (cf. Mata 1990) – prosody would in this case be an alternative to recover the specific discourse value of the yes-no question. Children have been argued to show very early awareness of certain prosodic contrasts (cf. Mazuka 1996, Guasti et al. 2001, Höhle et al. 2001, Cristophe 2002) but they have also been argued to have late access to certain other prosodic contrasts (cf. Gualmini et al. 2002; Vogel and Raimy 2002). As far as these data can tell, children do not seem to be aware of this intonation contrast at this point.

3.4 A short note on pragmatic development

As showed in section 2.2, *Ser* (Be) answers are inadequate as agreement answers to indirect requests / invitations. Tomás presents cases of inappropriate use of *Ser* (Be) answers, i.e., use of *Ser* (Be) answers as agreement answers to yes-no questions that are pragmatically requests or invitations (cf. 18). There are 9 occurrences of this type of inadequate answer in Tomás' data.

(18) *MAE: olha # filho # olha aqui
look son look here
"Son, look, look over here."
*MAE: vamos ver este # agora ?
are (we) going to see this now
"Shall we see this one now?"
*TOM: é .
is [Tomás 1;7.14]

4. Conclusions

The data discussed in this paper allow for the following preliminary findings:
(i) Verbal answers are available from the earliest stages, although *Sim* (yes), *Ser* (Be) and adverbial answers may not be available from the start;
(ii) The early availability of verbal answers may be evidence for early ability to deal with the default interpretation of yes-no questions, which is a topic-centred interpretation;
(iii) If verbal answers are instances of VP ellipsis, early verbal answers are evidence for production of VP ellipsis in the earliest stages;
(iv) In the early stages, children have difficulty recognising a yes-no question as a confirmation request. In particular, there is no evidence that children are aware of discourse and prosodic cues that allow the identification of a yes-no question as a request for confirmation;
(v) Even when they are able to produce *Ser* (Be) answers, children do not seem to be aware of the pragmatic constraints on this type of answer.

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Differences in Sentence Comprehension Tasks between Children with Williams Syndrome and Specific Language Impairment
Evidence from Greek[1]

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1. Introduction

Recently, language development in developmental disorders such as Williams syndrome (WS) and Specific Language Impairment (SLI) has received great attention by psycholinguists. Specifically, the question of whether linguistic abilities of children with SLI and Williams syndrome show any similarities or differences has motivated a number of studies (cf. Clahsen and Almazan 1998; Reilly et al. to appear). The reason for the particular interest that the above question received is the unusual profiles of individuals with WS and SLI. On the one hand, individuals with Williams syndrome, i.e. a rare neurodevelopmental disorder, exhibit a relative sparing of language abilities (Clahsen and Temple 2003; Clahsen and Almazan, 1998; Pléh et al. 2003; Volterra et al. 1996) despite mental retardation. On the other hand, language development in children with SLI is characterized by severe problems whereas their cognitive, motor, and social development falls within the normal range (cf. Stark and Tallal 1981). This unusual dissociation between linguistic and other cognitive abilities in WS and SLI raises at least two questions: The first is whether language abilities in both SLI and WS can be described in terms of selective deficits or sparing; the second is whether the grammatical profile of SLI children can extend to children with WS. Different answers are provided by two contrasting accounts of developmental disorders. According to Karmiloff-Smith and colleagues (Karmiloff-Smith 1998; Thomas et al. 2001; Thomas and Karmiloff-Smith to appear), language development in developmental disorders reflects the abnormal development of the entire cognitive system. A background assumption behind this line of reasoning is that atypical development cannot produce selective deficits while the rest of the system develops normally; in other words, there should be no evidence for 'residual normality' in developmental disorders (Thomas and Karmiloff-Smith to appear). If this is the case, then linguistic performance on the surface regardless of whether it is good or bad should result from abnormal functions in the underlying mechanisms. Besides, due to the ultimate abnormal functional architecture in developmental disorders, i.e. SLI and WS, it is predicted that (i) the linguistic behavior of impaired individuals will not be observed in

[1] I am grateful to all the children who participated in this study. Many thanks go to M-A.Chrysomalli, E. Darilis, E. Darili, E. Lefkou, A.Makridou-Timotheidou, K. Taze, K. Thomaidis, E. Varlamis, and M. Vlassopoulou, for their help with the identification of subjects. Part of the work included in this paper has been supported by a research grant from the Greek State Scholarship Foundation (IKY) awarded to the author; the preparation of this paper has been completed while the author has been supported by a Marie-Curie post-doctoral fellowship from European Commission (MCFI-2001-01891).

unimpaired children (ii) sharp distinction between aspects of linguistic performance of children with SLI and WS will not be exhibited. On the other hand, according to Clahsen and Temple (2003), the impaired/unimpaired linguistic performance can reflect selective deficits/selective sparing in language development in developmental disorders; hence, residual normality holds. If this is the case, then some linguistic abilities are expected to be unimpaired while other cognitive abilities are severely impaired. In particular, grammatical abilities are expected to be spared in WS and consequently different than those in SLI.

Adopting a comparative perspective to the grammatical profile of WS and SLI children, this study aims to investigate aspects of syntactic comprehension in Greek children with SLI and WS. First, it examines the performance of SLI and WS children on the interpretation of sentences with different syntactic properties. Second, it compares the performance of the WS and SLI children to that of mental age (MA) controls and language age (LA) controls respectively. Third, it provides a direct comparison between the WS and SLI performance. The implications for the current debate on residual normality in developmental disorders are briefly discussed.

2. The experiment

2.1 Subjects

The performance of four groups of subjects is presented here: one group of WS children, one mental age control group of normally developing children, one group of SLI children and one language age control group of normally developing children. Information on the selection processes and details on the profiles of these groups are presented below.

2.1.1 WS subjects and mental age (MA) control group

5 Greek children who were independently diagnosed with WS by multidisciplinary teams in Greek hospitals in Thessaloniki participated in this study. The diagnosis has been confirmed on the basis of the fluorescent in situ hybridization (FISH) technique, i.e. a specialized chromosome analysis utilizing specially prepared elastin probes. WS children's mental age was derived from the verbal and non-verbal IQ scores calculated on the basis of the Greek version of WISC-III test (Georgas et al. 1997). One control group of 10 normally developing children whose chronological ages were similar to the mental ages of the WS children participated in the experiment; specifically, each WS child was matched to two control children on the basis of mental age. The control children constitute the mental age (MA) control group. In Table 1, chronological age (CA) and mental age (MA) of the WS children and CA of the control group are presented.

	CA MEAN RANGE (S.D.)	MA MEAN RANGE (S.D.)
WS group	10.1 7;9-15 (2.94)	5 3;4-7;2 (1.88)
MA group	5 3;3-7;3 (1.7)	

Table 1. WS children and MA controls: Chronological age (CA) and mental age (MA)

2.1.2 SLI subjects and language age (LA) control group

8 SLI children[2] participated in this experiment. All children were selected from child centers in Greece and met the exclusion criteria proposed by Stark & Tallal (1981), i.e. normal non-verbal IQ performance, normal hearing acuity, absence of motor impairment, absence of autistic symptoms, absence of otitis media history, neurological impairment and psychoemotional disorders.

The linguistic abilities of the SLI children were assessed on the basis of the Diagnostic Verbal IQ test for Greek children (Stavrakaki and Tsimpli 1999). These SLI children performed significantly better on that part of the test examining the lexical abilities than examining grammatical (morphosyntactic) abilities [t (7)=-9.192 p<.001]; hence, they were characterized as SLI children with grammatical deficits (cf. van der Lely 1999). A control group of 16 normally developing children participated in the experiment. The matching procedure between SLI and normally developing children was as follows. Each SLI child was matched to two control children on the basis of individual raw scores from the Diagnostic Verbal IQ (DVIQ) test for Greek children (Stavrakaki and Tsimpli 1999). Therefore, the normally developing children constituted the language age control group for the SLI children. Details on groups' chronological age and raw scores from the DVIQ test can be found in Table 2.

	CA MEAN RANGE (S.D.)	RAW SCORES MEAN RANGE (S.D.)
SLI group	8;1 6;1-10 (1.47)	82.875 64-98 (12.510
LA group	4.4 3;6-5;6 (0.73)	81.18 63-100 (11.44)

Table 2. SLI children and LA controls: Chronological age (CA) and raw scores from the DVIQ test

There was no exact matching between children with SLI and WS; with respect to chronological age, the WS children are older than SLI children, whereas with

[2] For more details on linguistic abilities of these SLI children, see Stavrakaki (2001, 2002a, 2002b).

respect to mental age, the WS children ranged between 3;4 to 7;2 whereas the SLI children performed normally (in accordance with their chronological age).

2.2 Experimental material and procedure

2.2.1 Design and materials

The test sentences consisted of 6 sentence types with different syntactic properties. In particular, the experimental material included simple transitive structures with SVO word order as well as structures formed by A-bar movement i.e. subject and object wh-questions, subject and object-clefts, and A-movement, i.e. passive sentences. There were 14 exemplars for each sentence type except for wh-questions. Concerning SLI children and LA controls, 4 stories for each question type were invented; concerning WS children and MA controls, 8 stories for each question type were used. Examples of the sentence types are presented below:

Simple transitive sentences with SVO word order

(1) O elefantas kiniga ton pithiko
the elephant-nom chases the monkey-acc
"The elephant is chasing the monkey"

Subject-clefts

(2) O skilos ine pu kinighai tin katsika
the dog-nom is that chases the goat-acc
"It is the dog that is chasing the goat"

Object clefts

(3) O pithikos ine pu htipai o elefantas
the monkey-nom is that hits the elephant-nom
"It is the monkey that the elephant is hitting"

Who-subject questions

(4) Pjos kinijise ton elefanta?
who-nom chased the elephant-acc
"Who chased the elephant? "

Who-object questions

(5) Pjon klotsise i katsika?
who-acc kicked the goat-nom
"Who did the goat kick? "

Passive sentences

(6) O pithikos sproxtete apo tin tigri
the monkey-nom push-3s-passive by the tiger
"The monkey is pushed by the tiger"

2.2.2 Procedure

An acting out task was employed for all sentences except for wh-questions. This task requires the subject to manipulate toy animals in such a way so as to demonstrate the thematic roles of nouns in verbally presented sentences. Before beginning the task, the children were asked to identify all animals by pointing to them in turn when they were named by the experimenter. They were also encouraged to play with the toys in order to be familiar with them. Finally, the children were instructed to do what the experimenter said.

A somewhat different method, which is nevertheless based on a toy manipulation task, was used for who-questions. The children were told that they should help the puppet to understand what was going on in the story by telling the puppet the answer. Three figurines were placed on the table. For example, one dog, one elephant, and one fox. The experimenter told the child a story in which the fox was chasing the dog and after that the dog was chasing the elephant. At the same time, she showed that the fox was chasing the dog and the dog was chasing the elephant. At the end, the child should help the puppet to answer the following question: 'Who chased the dog?'

3. Results

All groups' correct performance on the test sentences is presented in Table 3 below:

	Transitive sentences (SVO) Mean Range (S.D.)	Who-subject questions Mean Range (S.D.)	Subject-clefts Mean Range (S.D.)	Who-object questions Mean Range (S.D.)	Object-clefts Mean Range (S.D.)	Passive sentences Mean Range (S.D.)
SLI group	100 100-100 (.0)	90.62 75-100 (12.93)	100 100-100 (.0)	65.63 50-75 (12.9)	12.5 0-28.57 (9.15)	18.75 7.14-35.7 (8.4)
LA group	100 100-100 (.0)	100 100-100 (.0)	100 100-100 (.0)	87.5 100-100 (12.9)	36.6 0-100 (32.1)	57.6 14.3-100 (34.5)
WS group	100 100-100 (.0)	90 75-100 (13.69)	100 100-100 (.0)	92.5 75-100 (11.18)	55.7 0-100 (51.6)	65.7 0-100 (42)
MA group	100 100-100 (.0)	100 100-100 (.0)	100 100-100 (.0)	97.5 75-100 (7.9)	50.7 0-100 (39.4)	52.8 14.3-100 (37.2)

Table 3. The correct performance (%) of all groups on the tested structures

As shown in Table 3, the normally developing children, i.e. MA and LA controls, showed ceiling performance on all structures with SVO word order, i.e. simple

transitive sentences with SVO word order, subject clefts and subject wh-questions. They have also showed near-ceiling performance on who-object questions, while their performance dropped on object-clefts and passive sentences. As far as the WS children are concerned, they showed ceiling and near-ceiling performance on all structures with SVO word order and near-ceiling performance on who-object questions. Noticeably, their performance was slightly better on object than on subject questions; however, this difference was not significant [Wilcoxon test Z=-.447 p=.655]. Similarly to typically developing children, the WS children's performance dropped on object-clefts and passive sentences. Ceiling and near-ceiling performance on all structures with SVO word order was also exhibited by SLI children whose performance dropped significantly on object who-questions and dramatically on object-clefts and passive sentences. Despite quantitative differences between groups, it should be noted that all groups' performance dropped on object-clefts and passive sentences. Therefore, the same structures were difficult for all groups.

In sum, all groups' performance was high on structures with SVO word order. However, while both typically developing children and WS children showed a high level of performance on object-questions, the SLI children's performance dropped significantly. Noticeably, all groups' performance dropped on object-clefts and passive sentences, but the SLI performance's drop was greater than that of the other groups. Interestingly, the WS children's performance was higher than that of typically developing children, i.e. MA and LA controls, on passive sentences, although this difference failed to reach significance [Mann-Whitney U test, p=.533 and p=.676 for comparisons between WS children and MA controls as well as between WS children and LA controls respectively].

To identify whether the SLI and WS children showed the same developmental trajectories as typically developing children, individual data analysis and error analysis were carried out. The former will show whether the attested performance is relatively homogenous or not, whereas the latter will indicate whether there are any qualitative differences between the groups' performance. Consider the SLI children's performance on the structures where no ceiling performance was attested, as shown in Table 4:

	RAW SCORES (LA TEST)	WHO-S	WHO-O	OBJECT-CLEFTS	PASSIVES
Nikos	83	100	50	14.28	7.14
Marios	94	100	75	0	21.42
Agni	91	100	75	14.28	21.42
Antonis	74	100	75	28.57	14.28
Manolis	98	100	75	0	21.42
Linos	90	75	75	14.28	35.71
Maria	69	75	50	14.28	14.28
Akis	64	75	50	14.28	14.28

Table 4. The SLI children's raw scores on the LA test and their correct performance (%) on subject and object questions, object-clefts, and passive sentences.

Noticeably, all children with SLI had problems with object wh-questions and especially with object clefts and passives. In Table 5, the WS children's performance on all structures where no ceiling performance was found is presented.

	MA	SUBJECT QUESTIONS	OBJECT QUESTIONS	OBJECT CLEFTS	PASSIVES
Lazaros	3;4	75	75	0	78.5
Nasos	3;4	75	100	78.5	0
Eleni	4;2	100	87.5	0	50
Giorgos	6;9	100	100	100	100
Filio	7;2	100	100	100	100

Table 5. The WS children's mental age (MA) and their performance (%) on subject and object questions, object-clefts, and passive sentences

As shown in Table 5, there were only two children whose performance was ceiling as predicted by their mental age (6;9 and 7;2 respectively); however, the younger children whose mental age ranged from 3;4 to 4;2 showed heterogeneous performance. It should be noted that their performance is within the normal range since such variation has been attested in the performance of younger children with typical development (see range of correct performance of MA and LA controls on object-clefts and passives in Table 3). Moreover, further comparisons between the 3 younger WS children's performance and their 6 mental age controls showed no significant differences between groups' performance on the test structures except for subject wh-questions [Mann-Whitney U test p=.033]. The correct performance of the 3 younger WS children and their mental age controls is presented in Table 6 below.

	transitive sentences (SVO) Mean Range (S.D.)	who-subject questions Mean Range (S.D.)	Subject clefts Mean Range (S.D.)	who-object questions Mean Range (S.D.)	object-clefts Mean Range (S.D.)	passive sentences Mean Range (S.D.)
WS group	100 100-100 (.0)	83.33 75-100 (14.43)	100 100-100 (.0)	87.5 75-100 (12.5)	26.16 0-78.5 (45.32)	42.83 0-78.5 (39.73)
MA group	100 100-100 (.0)	100 100-100 (.0)	100 100-100 (.0)	95.83 75-100 (10.2)	30.95 0-100 (36.6)	26.18 14.28-50 (18.44)

Table 6. The correct performance (%) of the 3 younger WS children's compared to that of the mental age controls

Error analysis indicated that normally developing children and children with WS showed similar pattern of performance. For the purposes of error analysis, both

LA and MA controls have been included in the category 'normally developing children' (NDC); therefore, 26 children were included in this category. The proportion of error types out of the total number of errors in the interpretation of object questions, object clefts, and passive sentences by normally developing children (MA and LA controls) and WS children is presented in Table 7.

	OBJECT QUESTIONS		OBJECT CLEFTS		PASSIVE SENTENCES	
	NDC N=10	WS N=3	NDC N=211	WS N=31	NDC N=163	WS N=24
Reversal of theta-roles	70	33.33	100	100	92.025	95.83
Reciprocal interpretation					7.975	4.16
Case error	30	33.33				
Gender error		33.33				

Table 7. Normally developing children (NDC) and WS children: The proportion (%) of error types out of the total number (N) of errors produced by children

With respect to the interpretation of object-questions both groups produced reversal of theta-role errors as well as case errors. Recall that children were required to tell the puppet the answer in the wh-question comprehension task. Some children produced case errors when they gave the answer, i.e. they produced the correct DP marked for incorrect case, i.e. nominative instead of accusative. It should be noted that this is a production and not comprehension error but it was included in the error types produced since it does not constitute the adult response. One WS child made a gender error, i.e. she produced the correct DP marked in incorrect gender. Although this error type was not produced at all by normally developing children, it cannot indicate qualitative differences between WS children's performance and that of controls, since it was attested once. Moreover, both normally developing and WS children produced the same error types while they were interpreting passive sentences. Specifically, they produced reversal of theta-roles errors and reciprocal interpretation errors; the latter are possible in Greek due to the fact that both passive and reciprocal constructions share the same suffix. Furthermore, WS children and normally developing children produced reversal of theta-role errors in the interpretation of object-clefts. However, WS children produced some reversal of theta-role errors in the interpretation of subject wh-questions, whereas normally developing children did not. Although WS children's performance seems to be deviant to some extent, it should be noted that their performance on subject-questions is still high and the overall comparison between all WS children's performance and that of normal controls did not reach significance (see Table 3). By contrast, the only error type that SLI children produced in wh-questions, object clefts and passives was reversal of theta-roles. This error type confirms SLI children's difficulties with interpreting complex syntactic structures, since SLI children could not identify theta-roles in structures where such identification is dependent on syntactic processes.

4. Discussion

In this study, I have investigated the linguistic ability of comprehending sentences in Greek children with WS, SLI, and normal development. The aims were to determine whether there were any similarities and/or differences between the performance of individuals with WS, SLI and normal development. Furthermore, I was interested in determining whether the performance of children with WS on sentence comprehension can be described in terms of residual normality or not.

On the one hand, the SLI children performed at ceiling on all structures with SVO word order regardless of whether they are base-generated, e.g. the transitive sentences with SVO word order, or formed by A-bar movement, e.g. who-subject questions and subject clefts. Therefore, the SLI children used the default SVO word order strategy to interpret these structures. However, the SLI performance drops significantly on the interpretation of who-object questions, object clefts, and passive sentences, as syntactic interpretation of these structures requires knowledge of syntactic movement, i.e. the A-bar and A-movement. It should be noted that the drop of SLI performance on object-clefts and passive sentences is greater than that on object-questions. Therefore, although all structures that require syntactic interpretation and include long-distance dependencies cause problems to SLI children (cf. van der Lely 1998, 1999), the specific syntactic characteristics of these structures play an important role in SLI comprehension, since the SLI children do not show the same level of performance on the interpretation of object clefts, object wh-questions, and passives. To be more specific, I suggest that the specific binding requirements of operators in wh-questions and clefts affect the SLI performance. In particular, the formation of wh-questions in Greek requires overt raising of a wh-operator to clause initial position, thus creating an A-bar chain with the wh-operator in Spec-CP binding a variable in the base position (Browing 1987; Chomsky 1986) whereas the formation of clefts requires a relative operator moved to an A-bar position which needs to be co-indexed with its variable and with the head NP; hence the linking status of the relative operator (Wexler 1991). Although all structures with A-bar movement are difficult to understand, the 'double' co-indexation of the relative operator with its variable and the head NP is more demanding than the 'single' co-indexation of the wh-operator with its variable.

On the other hand, A-bar movement in who-object questions does not prevent LA controls from showing a high level of correct performance on these questions. Therefore, normally developing children exhibit knowledge of the syntactic operations that take place in wh-question formation. However, their performance drops on the interpretation of object-clefts and passive sentences. It might be the case that the same restrictions that hold for SLI children's interpretation of object clefts are operative in normal grammar; in other words, the drop of normal performance on object-clefts and passives might be related to the linking status of operator in object-clefts (cf. Guasti and Shlonsky 1995) and A-chains in passive structures (cf. Borer and Wexler 1987).

Noticeably, the WS children's performance was close to that of normally developing children. In particular, the WS children showed a very high level of performance not only on the structures with SVO word order but also on who-object questions. The drop of their performance on object clefts and passive sentences does

not result in below chance performance, as is the case with the SLI children but it is within the normal range. Crucially, the performance of the WS children is not significantly different than that of the MA controls on all tested structures although it is better than MA controls' performance on passive sentences. However, when the younger WS children's performance was compared to that of their mental age controls, it was found that the younger WS children performed significantly lower than normal controls on who subject-questions. This significance might be due to the ceiling level of performance that the normal controls showed. It should be noted that the WS children performed better than their mental controls on object questions and passive sentences. Noticeably, a recent study on Greek WS children's ability to produce wh-questions (Stavrakaki to appear) indicated that two out of three children showed ceiling performance on both subject and object wh-questions whereas one child performed better on the production of who-object than of who-subject questions. This preference for grammatical processes and rules (required for object wh-questions and passive sentences) over simple heuristic strategies (e.g. use of the SVO word order strategy for sentence interpretation) is compatible with the profile of WS children as referred in the literature. Specifically, WS children overuse grammatical rules of past tense formation in English (Clahsen and Almazan 1998) as shown by the overgeneralization of the regular suffix both to existing regular forms and to novel words rhyming with existing irregulars. Except for overusing grammatical rules excessively, the WS children of this study did not show any differences from normally developing children in both quantitative and qualitative terms, as shown by their level of correct performance and error types produced.

In sum, normally developing children and WS children indicated knowledge of complex syntactic structures such as wh-questions; the drop of WS and normal performance on object clefts and passives is rather related to the specific acquisition requirements of these structures. By contrast, SLI performance is characterized by severe problems with interpreting complex syntactic structures, i.e. object questions, clefts, and passive sentences. It is suggested that the syntactic properties of these structures, i.e. the specific binding requirements of operators in wh-questions, clefts as well as A-chains in passive sentences, contribute to the drop of SLI performance. In conclusion, the results of the present study indicate that children with SLI and WS show distinct linguistic profiles; they are also taken to support the view that -as far as the reception of syntax is concerned- WS children show normal abilities; in this respect, residual normality holds for children with WS (cf. Clahsen et al. to appear; Temple and Clahsen to appear).

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Acquisition Evidence for an Interface Theory of Focus*

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1. Introduction

Main stress in English falls on the rightmost element. As the following question-answer pairs illustrate, an utterance with neutral stress is ambiguous with respect to its focus interpretation (Chomksy 1971). In particular, neutral, rightmost stress allows for DP_{IO}, VP- and IP-focus. See (1b), (1d) and (1f) respectively.[1]

(1) a. Who did the mother give some milk to?
b. The mother gave some milk to the BOY.
c. What did the mother do?
d. The mother gave some milk to the BOY.
e. What happened?
f. The mother gave some milk to the BOY.

As is well known (e.g. Selkirk 1984), the same interpretative ambiguity (wide vs. narrow focus readings) is lacking in utterances with marked stress, where stress has been shifted to the direct object. See the question-answer pairs in (2c-d), (2e-f).

(2) a. What did the mother give to the boy?
b. The mother gave some MILK to the boy.
c. What did the mother do?
d. #The mother gave some MILK to the boy.
e. What happened?
f. #The mother gave some MILK to the boy.

How do we account for the availability of wide focus readings in (1) and how do we exclude them in cases like (2)? There are essentially two possibilities. First, one might argue that the focus in (1) is essentially different from the one in (2). For instance, one might try to differentiate these foci along the presentational vs. contrastive focus distinction, endorsed by many in the literature (e.g. Selkirk 1995; É.Kiss new information focus vs. identificational focus; Zubizarreta and Vergnaud 2000 i-focus (information focus) and c-focus i.e. contrastive focus). Although

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[1] Throughout the paper, focus is indicated by underlining, while capitals mark main stress.

explicit proposals that intend to account for the difference between (1) and (2) along these lines are essentially lacking, it seems natural that once such distinctions are assumed they should encompass this kind of data.

A proposal along these lines would have to claim that stress on the direct object in (2) is associated with a different syntactic (or semantic) focus marking, let us call it [+contrastive focus], while the focus in (1) is either marked [+ new information focus] or does not have a syntactic marking. The [+contrastive focus]-feature is associated with marked, shifted stress, while neutral stress marks new information focus. Let us call this *the syntactic view* of focus, on grounds that it advocates a different syntactic encoding for examples like (1) and (2).

An alternative view, proposed by Reinhart (1995, to appear), following Cinque (1993), argues that there are no distinctions between different types of focus in the grammar. In fact, focus itself is not encoded syntactically, rather it is identified at the interface, where both the LF and the prosodic structure of the utterance are available. At the interface, the focus is determined by the position of main stress. There is no need for an entity like the focus feature (Szendrői 2001). As a result, (1) and (2) cannot be distinguished on the basis of the type of focus feature they have (or whether one of them lacks such a feature). In effect, (1) and (2) are not distinguishable in the syntax, the prosodic difference between them only becomes relevant for focus identification at the interface. I will call this *the interface view*.

The syntactic view of focus and the interface view are not notational variants (see Neeleman and Szendrői 2004). In this paper, following and extending a proposal by Reinhart (1999), I argue that the two theories make distinct predictions for language acquisition. The results of the conducted experiment favours Reinhart's interface view, i.e. that focus is identified at the interface on the basis of prosodic information, rather than encoded syntactically, by means of a focus feature.

I will start by an informal summary of what it takes to interprete utterances where different focus readings give rise to different truth-conditions. The discussion encompasses the semantics of the focus-sensitive operator *only* and the various potential or actual focal ambiguities of *only*-sentences with neutral and shifted stress. In section 3, I give a detailed account of the two different proposals in the literature with respect to how focus is represented in the grammar: the interface view (Reinhart 1995, to appear) and the syntactic view (É.Kiss 1998; Zubizarreta and Vergnaud 2000). I also show that the two theories give different predictions for the acquisition of focus in the case of non-neutral stress. Section 4 describes the experiment that was conducted to determine the acquisition facts. Section 5 concludes that the acquisition data favour the interface view.

2. Understanding utterances with *only*

2.1 The semantics of *only*-sentences

Only-sentences are potentially ambiguous. As the following data illustrate, the resolution of the semantic ambiguity hinges on stress (i.e. capitals). Consider (3) and (4) in a situation where the mother gave some milk to the boy and some milk and some coffee to the father. Here, (3) is false, while (4) is true.

(3) The mother only gave some milk to the BOY

(4) The mother only gave some MILK to the boy

So, depending on where main stress falls, the utterances differ in their truth conditions. Most theories of the interpretation of *only*-sentences agree that the operator *only* associates with the focus of the utterance. Different stress placement comes with different focus readings. So, by transitivity, stress placement affects the interpretation of *only*-sentences. Thus, the ambiguity is not introduced by *only* itself. Rather, *only* is focus-sensitive, i.e. the scope of *only* is the focus of the utterance, and different stress placement comes with different focal interpretations. What *only* adds is that sentences with different foci, have potentially different truth-values.

Thus, the interpretation of *only* sentences has to reflect the focus-sensitivity of *only* and its ability to cause a truth-conditional difference. Informally, one could paraphrase the meaning of (3) and (4) as in (5a) and (6a) respectively.

(5) a. The only person that the mother gave milk to was the boy.
b. Focus= boy Contrast set 1:{boy, man}

(6) a. The only thing that the mother gave to the boy was milk.
b. Focus= milk Contrast set 2: {milk, coffee, tea}

The stressed element is the focus in both cases. In context, a contrast set is formed involving the focal element and other entities for which the proposition could potentially hold. In the specific context given above the contrast sets are as in (5b) and (6b). In both cases, the (informally stated) meaning of the proposition is that the only entity in the relevant contrast set that the proposition holds for is the boy in (3) and the milk in (4). In other words, (3) means that the mother gave some milk to the boy, but she did not give milk to any other person present. While (4) means that she gave some milk to the boy, but she did not give any other drinks to the boy.

So far we have seen that stress placement affects the interpretation of *only*-sentences truth-conditionally. In order to determine the meaning of a sentence with *only*, one has to know the semantics of *only* informally stated above. In order to apply the semantics, one has to be able to determine the focus of the utterance.

2.2 Focus projection – focal ambiguity with neutral stress

But this is only half of the story. In fact, the utterance in (3), with neutral intonation, is focally ambiguous in itself. In different contexts, adults allow both reading (7a)=(5a) and (7b). In particular, in the context described above the interpretation in (7a) is false because the boy was not the only one that received milk; the interpretation in (7b) is also false, but for a different reason, namely because the mother also gave drinks to the father.

(7) a. The only person that the mother gave milk to was the boy. Focus= DP_{IO}
b. The only thing she did was giving some milk to the boy. Focus= VP

But if a neutrally stressed utterance with *only*, such as (3), is ambiguous, as shown in (7), then which one of the possible readings is actually selected by the

hearer when they are parsing the sentence? If the previous discourse or other contextual factors favour one of the readings, that reading will be selected. Out of context, or if the context allows both readings, adult native speakers have a preference for the narrow focus reading, (7a) (Crain et al 1994).

2.3 Children's preference for a wide focus reading

Importantly, the preference for the narrow focus reading is not entertained by children (Crain et al 1994). Young children do not have the resources to handle this kind of ambiguities; they can only allow one reading. Moreover, the language learning child has to adopt (7b), the *wide* scope reading, as the only possible reading, otherwise they will face a learnability problem. Since (7b) entails (7a), it would be impossible for the child to discover that (7b) is a possible reading of (3) on the basis of positive evidence, in case they adopted (7a) as the interpretation of (3). This is the semantic subset principle (Crain et al 1994: 455). The same argumentation is illustrated below for an actual test item from the experiment reported in this paper.

(8) allows for the readings given in (9a) and (9b). Note that in all the possible worlds where (9b) is true, (9a) is also true. In other words, (9b) entails (9a). However, there are possible worlds, for instance the one depicted in (10), where (9a) is true while (9b) is false. So the relationship between the set of possible worlds that make (9a) true and the set of possible worlds that make (9b) true is a superset-subset relation. Given the assumption that children do not have access to negative evidence and that they cannot handle the ambiguity, they must interpret (8) with the wide focus, as in (9b). To sum up, children have a default interpretation with *only* in neutrally stressed utterances that associates *only* with the VP.

(8) Tigger only threw a chair to PIGLET.

(9) a. The only creature that he threw a chair to was Piglet. Focus= DP_{IO}
b. The only thing he did was throwing a chair to Piglet. Focus= VP

(10) Tigger threw a chair to Piglet, then he jumped onto the bed.

So far we have seen that the operator *only* is sensitive to the focus of the utterance. If the utterance has neutral stress, the sentence is focally ambiguous. In this case, adults and children entertain different preferences. Adults favour the narrow focus reading, at least out of context; children have a preference for the wide scope reading irrespective of context. Now we turn to utterances with *only* that have non-neutral stress placement, such as (2).

2.4 Lack of focal ambiguity with shifted stress

As I mentioned above, the same interpretative ambiguity (wide vs. narrow focus readings) is lacking in utterances with marked stress. The same is true if *only* is present. Wide focus isn't available with stress shift, so *only* cannot associate with it:

(11) He only threw a CHAIR to Piglet.

(12) a. The only thing that he threw to Piglet was a chair. Focus= DP_{DO}
b. #The only thing he did was throwing a chair to Piglet. Focus= VP

Since no ambiguity arises, there is no preferred scopal reading in the case of adult native speakers. They simply interpret utterances with shifted stress with narrow scope on the constituent that bears main stress. Two potential questions arise. First, given that there is an interpretative ambiguity in the case of utterances with neutral stress, why are utterances with shifted stress unambiguous? Second, given that children entertain a non-adultlike default interpretation in neutrally stressed *only*-sentences, do they have an adultlike interpretation of *only*-sentences with stress shift? There has been continuous debate on the first question ever since Chomsky's (1971) proposal. I summarise the two opposing views in the next section. As for the second question, it can be settled experimentally. The main proposal of this paper is that the answer to the second question is potentially illuminating to the debate on the first. In particular, I argue that the two opposing views in the literature on the lack of interpretative ambiguity involving stress shift give different predictions for language acquisition.

3. Representing focus in the grammar

3.1 Identifying focus at the interface

Reinhart (1995, to appear) follows Chomsky (1971) in claiming that the focus of an utterance is determined by its prosodic properties, in the sense that any constituent that contains the main stress of the utterance is a possible focus of the utterance. So, she argues for a theory of focus where focus is identified at the interface on the basis of prosodic information. Thus, each utterance has a focus set: the set of all possible foci of that utterance (see 13). To illustrate this, the focus set of (14a), an utterance with neutral rightmost stress, falling on *Piglet*, is given in (14b). Accordingly, the utterance is an appropriate answer to the questions in (15).

(13) *Focus set*:
The focus set of a derivation D comprises all and only subtrees (constituents) which contain the main stress of D. (Reinhart *to appear*: 217)

(14) a. Tigger threw a chair to PIGLET.
b. Focus set of (14a): {DP_{IO}, VP, IP}

(15) a. Who did Tigger throw a chair to? (Focus=DP_{IO})
b. What did Tigger do? (Focus=VP)
c. What was that rumbling noise? (Focus=IP)

(16a), with shifted stress does not allow wide focus readings. So (16a) is not an appropriate answer to the questions in (17b) and (17c).

(16) a. Tigger threw a CHAIR to Piglet.
b. Focus set of (16a): { DP_{DO}, VP, IP}

(17) a. What did Tigger throw to Piglet? (Focus=DP_{DO})
b. #What did Tigger do? (Focus=VP)
c. #What was that rumbling noise? (Focus=IP)

Reinhart argued that the reason for the unavailability of the wide focus interpretations is due to the fact that these interpretations *are* available in the neutrally stressed (14a). So, although the wide focus readings are members of the focus set of (16a) by the definition in (13), they are rendered inappropriate by economy considerations. In particular, under an intended focus=VP or IP interpretation, the optional prosodic operation that placed main stress on the direct object in (16a) was applied unnecessarily. This is because the wide focus interpretations are available in the focus set of the original derivation (14a), without stress shift. Assuming that optional operations only apply if necessary, the unavailability of the wide focal readings in (16a) follows.

Note that Reinhart maintains a unified definition of the focus set in cases with neutral and shifted stress. This comes at the cost that for utterances with stress shift, a comparison of full derivations (i.e. (16a) and (14a)) is required at the interface to determine whether the intended interpretation was allowed. If the intended interpretation was focus=direct object, i.e. narrow focus, then the result of the reference set computation (i.e. comparison) will be that stress shift was legitimate, as that interpretation is not available in the focus set of the utterance with neutral stress. If the intended focal interpretation was the wide focus readings VP or IP, the comparison of the shifted case with the neutral case will reveal that stress shift was applied unnecessarily. These readings will be ruled out in the stress shift case. Either way, in all cases involving stress shift, a comparison of derivations under an intended interpretation is necessary, whether the outcome is positive or negative.

3.2 Encoding focus in the grammar

An alternative, widely-held explanation states that shifted stress and neutral stress possess different focussing abilities. Shifted stress, as in (16a), only allows narrow focus readings, while neutral stress in (14a) may project focus to higher constituents. Despite fundamental differences between them, two influential approaches, É.Kiss (1998) and Zubizarreta and Vergnaud (2000), both subscribe to this view. In their proposals contrastive focus, i.e. focus associated with marked prosody, is different from new information focus, which is signalled by neutral stress. One of the characteristic differences between the two is that focus projection, i.e. availability of wide focal interpretation, is only possible in the case of new information focus. By definition, contrastive focus does not project. Wide focus in the case of shifted stress is simply disallowed by the grammar. There is a grammatical marking attached to the contrastively focus constituent. In actuality, in both proposals, this is some kind of focus-feature. The marking is already present in the syntactic derivation. At the interface, the constituent bearing the focus feature is simply interpreted as focus. Thus, in this view, there is no need for comparison of derivations at the interface. The availability of a certain focal interpretation is predicted by the syntactic characteristics of the utterance in question.

3.3 Predictions for language acquisition

Many conceptual and empirical arguments are available that argue against the proposed distinction between contrastive focus and new information focus (See e.g. Szendrői 2001, 2003; Neeleman and Szendrői 2004). Theoretical issues aside, the feature-based theories and the interface theory of focus make different predictions for language acquisition. If the wide focus reading is intrinsically disallowed in the case of shifted stress, there is no reason why children should ever assume it. Upon hearing shifted stress they should immediately associate the stressed constituent with a focus feature and derive the correct narrow focal interpretation. The learnability argument mentioned in section 2 is irrelevant as the utterance with marked stress is never ambiguous in the adult grammar. The semantic subset principle only applies if two readings that are *potentially* available in natural language are in a subset-superset relationship. If the subset reading is never actually present in adult grammar, it is irrelevant that it would be unlearnable if it was present.

The only reason why children might assign wide readings to marked stress cases is if they fail to distinguish marked stress from neutral stress. In principle, this could be the result of two different shortcomings in the children's linguistic abilities. First, inability to recognise shifted stress may be due to perceptual difficulties, in the sense that the phonetic characteristics of shifted stress (to the extent that they are present) are impercetibly small for the children. This possibility can be excluded on the basis of a wealth of studies that show that even infants have very sensitive prosodic perception (see e.g. Morgan 1986; Hirsch-Pasek et al 1987; Jusczyk & Thompson 1978; Mehler et al 1988). Second, it could be the case that children do not realise that shifted stress is in fact shifted with respect to some canonical stress placement. In other words, children might not know the stress rules of their language and thus potentially treat all types of stress (shifted or neutral) alike. Again this is very unlikely given the highly advanced prosodic (both tonal and rhythmic) abilities of very young children (see also Halbert et al 1995).

In contrast, take Reinhart's interface approach. Here, in stress shift cases, the wide reading is actually allowed by the grammar. It is only ruled out at the interface due to the availability of the wide interpretation in the case of the neutrally stressed utterance. If so, then children should entertain the wide reading in the stress shift cases, in order to avoid the potential learnability problem, just as they do in the case of the utterance with neutral stress. In other words, even though the wide readings are never actually allowed in adult language, the adult grammar itself does allow for the ambiguity. Children, who aim to build such a target grammar, will have to entertain the wide focal readings to avoid the learnability problem, which never *actually* arises, but could do so potentially.

The interface view makes a further prediction. Recall that young children are unable to handle ambiguity due to their limited working memory resources. Reinhart (1999) argues that comparison of full derivations at the interface, which is involved in stress shift cases, is also taxing for working memory. It seems natural to assume that children who are able to handle one can also do the other. In other words, we expect that some children will resort to a wide focal interpretation in the stress shift case, because they cannot perform the reference set computation required at the interface. The same children are also expected to have a VP-default interpretation in

the neutral stress case, as they cannot yet handle focal ambiguity. However, children who are already adultlike in the stress shift case, should also be adultlike in the neutral stress condition, i.e. assign a narrow focus interpretation in this case.[2]

Such a correlation of the results between neutral and shifted stress is not predicted in the syntactic view. Here, neutral and stress shift cases are treated differently in the grammar, so it is not expected that children improve on both at the same time.

To sum up, if it turns out that children entertain a wide focus reading in cases with stress shift, just as they do in the neutrally stressed case, that supports Reinhart's interface view. This is because in the interface view, the wide, VP-focus reading is potentially available in the grammar, while it is completely disallowed in the syntactic view. In addition, assuming that handling focal ambiguity and reference set computation at the interface places similar burdens on working memory, it is predicted in the interface view that children start giving adultlike answers on both conditions at the same time. No such temporal coincidence is expected in the syntactic view, where new information focus and contrastive focus are treated differently in the grammar.

4. The experiment

4.1 Materials

The present experiment was a truth-value judgement task (Crain & McKee 1985), following the design of Gualmini et al (2002). To maintain uniform pronunciation of the test sentences throughout, the utterances were pre-recorded. A talking robot, Robbie, performed the usual task of the puppet, because it was thought more natural for a robot to have a recorded voice. The child heard a story such as the one in (25) from one of the experimenters (a Dutch native speaker), while the other experimenter performed the story with props. At the end of the story, Robbie was asked to explain what he thought happened. Then the child was called upon to judge whether the robot paid attention or not.

Robbie's utterance always contained a verb with three arguments, either *give*, *throw* or *sell*. In the stress shift stress condition (marked stress=MS), main stress fell on the direct object, as in (19a). In the neutral stress condition (NS), stress fell on the

[2] Given the interface view, children are expected to have access to both the VP and the narrow DP interpretation both in the case of stress shift and neutral stress. So they experience both as cases involving interpretative ambiguities. As for the specific predictions, an alternative position, suggested to me by Tanya Reinhart, is also possible. One might assume that contrary to Crain et al (1994), in the neutral stress case, children do not apply the semantic subset principle, rather they choose one of the allowed interpretations randomly when they face an interpretative ambiguity, which they cannot handle. Thus, they choose from wide VP and narrow DP readings randomly both in the case of stress shift and neutral stress. However, this does not necessarily mean that each individual child assigns random interpretations. It seems more likely that at least some of them develop a strategy. Thus, one would predict that some children will assign a narrow interpretation to cases with neutral stress and also to cases with stress shift and some will assign wide interpretation to them and some will give random interpretations. As noted in Section 4, the results are compatible with this view. Further experiments are needed to clarify the issue.

indirect object (19b). The English translation of the story corresponding to the test sentences in (19) is given in (18).

(18) This is a story about Tigger, Piglet and Winnie the Pooh. They are playing in the garden. There is a lot of old furniture around. Tigger claims that he is really strong, in fact he is so strong that he can throw this big chair to Winnie. Winnie says: 'That's not possible. You can't be that strong!' But Tigger says: 'Look!' and throws the chair over to Winnie. Then Tigger says: 'I am very very strong! I can also throw this big table to Winnie.' Winnie says: 'Let me see whether you are really so strong. Throw the table over to me!' Tigger says: 'Look here!' and throws the table over to Winnie. But now Piglet (who is standing a little bit further away from Tigger than Winnie) says: 'You are really strong Tigger! But are you strong enough to throw something over to me? I am standing further away than Winnie. It is more difficult to throw something here. There is another chair in the corner. Can you see it? Throw it over to me if you are really so strong!' Tigger says: 'No problem. I can do that too. I am SOOOO strong!' and throws the chair over to Piglet. Piglet says: 'Well done. But there is also a wardrobe behind you. Can you throw that one over to me?' Tigger walks over to the wardrobe. It's really heavy. He can hardly lift it. In fact, it is so heavy that he cannot throw it over to Piglet. So he says: 'I am a little tired. And I already showed you how strong I was, so I am not throwing the wardrobe over to Piglet.'

(19) a. NS: Hij heeft alleen een stoel naar KNORRETJE gegooid.
he has only a chair to Piglet thrown
"He only threw a chair to PIGLET."

b. MS: Hij heeft alleen een STOEL naar Knorretje gegooid.
he has only a chair to Piglet thrown
"He only threw a CHAIR to Piglet."

The experiment started with a few minutes while the experimenters made sure that the child knows all the props by name. Robbie was introduced and the child was encouraged to 'communicate' with him. Then a practice trial was performed (and repeated if necessary) to see if the child can perform the experiment. Afterwards, each child heard six stories (2 NS, 2 MS and 2 fillers).

Maintaining the design of Gennari et al, the stories were designed in such a way that in the neutral stress condition, adults answer NO, because Winnie also got a chair. In other words, adults identify the focus of the neutrally stressed utterance with the indirect object. In the marked stress condition, adults answer YES, because it is true that Piglet only got a chair and nothing else. So, they identify the focus of the marked stress condition to be the direct object. This means that determining the focus of the utterance is crucial in determining the judgement. In the marked stress condition, the child will only give a YES answer, if they understand the focus to be the direct object. If they were to disregard stress shift and identify the focus as the indirect object, they would give a NO answer.

However, note that the child would also give a NO answer in the marked stress condition if they were to identify the focus of the utterance as the VP. This is so,

because throwing a chair over to Piglet is not the only thing Tigger did. How are we to determine whether a child that answers NO in the marked stress condition has a wide focus interpretation in mind (focus=VP) or a narrow one (focus=indirect object)? In fact, the same question arises in the neutral stress condition. As seen above, adults judge the utterance with neutral stress to be untrue, because Piglet was not the only one that got a chair. They reject the utterance on the narrow focus reading (focus= indirect object). However, as Crain et al (1994) showed, children entertain the wide focus interpretation in utterances with *only*. So, in the neutral stress condition, children should say NO for a different reason than adults do.

To determine the focus interpretation children assign, in each case that a child gave a NO answer, both in the marked stress condition and in the neutral condition, the experimenter encouraged the child to explain why they thought Robbie was wrong. In many cases, the children's answer revealed the focus interpretation they assign to the robot's utterance because the answer contained members of the contrast set (see (5) and (6) above). Two typical answers are given in (20). (20a) reveals that the child interpreted the utterance with wide focus, as he enumerated all (or many of) the events Tigger did. At least one of these events (he also threw a table to Winnie) is only relevant under a VP-focus interpretation. In contrast, if one disregards the possibility of ellipsis, then (20b) indicates narrow focus interpretation.

(20) a. - Because he also threw a chair to Winnie and he also threw a table to Winnie.
b. - Also to Winnie.

4.3 Subjects

28 Dutch native speakers took part in the experiment. Their age ranged from 4 years 1 month to 6 years 10 month, with the average age of 5 years 5 months. The results were analysed for 23 children. 5 were excluded: 1 did not finish the experiment, 2 gave six YES answers, and 2 were distracted.

5 Results and discussion

The overall results are given in Table 1. A Fisher's exact test revealed that the results of the two neutral stress items were not significantly different (NS1, NS2: p=.002). The same holds for the marked stress items: MS1-MS2: p=.002. Significant difference was found between the neutral and the marked items NS-MS: p=.24.

Table 1 shows that performance is adult-like (i.e. NO) on the neutral stress condition, while it is around chance on the marked stress condition. This result is in line with the findings of Gualmini et al 2002 for American children of similar age.

Table 1	Neutral stress (NS)	Marked stress (MS)
YES	15,2% (7)	52,2% (24)
NO	84,8% (39)	47,9% (22)

Table 1: Overall results

Individual data analysis reveals that the result is significantly different from a random guess (Wilcoxon $p \leq .02$) This is illustrated in Figure 1. The patterns are

given on the horizontal axis, while the number of children with that pattern is on the vertical axis. The majority of children fall into two groups, the NNYY-group, and the NNNN-group. There are also three children, where it is not possible to decide whether they are adultlike or not on the marked stress condition. Since the NO answer in the marked stress condition is only compatible with the wide VP-focal reading, we may conclude that a group of children, in fact 9, entertain this interpretation in the case of marked stress. This gives support for Reinhart's interface theory.

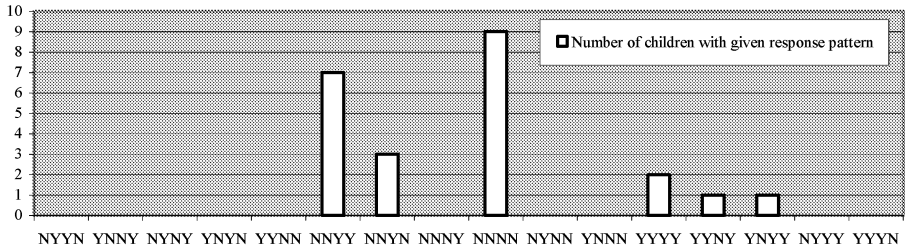

Figure 1: Response patterns (NS_1 NS_2 MS_1 MS_2) N=NO; Y=YES

So far we studied children's answers in the conditions. However, recall that an adultlike NO answer in the neutral stress condition does not necessarily indicate adultlike narrow focus interpretation on the indirect object. The NO answer is also compatible with a wide VP-focal interpretation. The results of the follow-up question reveals that children with an adultlike NNYY pattern assign adultlike narrow focal interpretations, while children with a non-adultlike NNNN pattern assign wide VP-focus interpretations. The correlation is statistically significant both ways (χ^2 test: $p \leq .01$; Fisher's exact test: $p=.005$).

Table 2	IO-focus (narrow)	VP-focus (wide)
NNYY	10	2
NNNN	2	11

Table 2: Correlations between response pattern and focal interpretation

The results favour the interface theory of focus. Given that some children access the VP-focus interpretation in the case of stress shift, we can conclude that this reading is not excluded in the grammar. Rather it is disallowed at the interface as a result of reference set computation. The children that assign VP-readings fail to do this computation, and thus have no reason to exclude this reading.

There are two possible interpretation of the results of the children that assign narrow focus interpretation to the stress shift cases, i.e. give adultlike answers. Crain et al (1994) argued that the reason why children assign wide focal interpretations in the neutral stress case is due to their working memory limitations, which do not permit handling interpretative ambiguities. If so, then the results reveal that the moment children become capable of handling the ambiguity and assign the adultlike narrow focus interpretation in the neutral stress condition, they are also able to

compute the reference set computation required to determine whether the wide focal interpretation was available in the stress shift case.

The results are also compatible with the alternative hypothesis in Fn. 2. There seems to be three groups of children, those that assign a narrow focus interpretation, those that assign a wide one, and those that do not apply strategies, but assign narrow or wide interpretations randomly. The fact that so many (i.e. 7 out of 23) children assign what looks like an adultlike interpretation strongly suggests that the alternative hypothesis is the correct one. It would seem unlikely that one third of the children would have significantly larger working memory capacities than the rest of the group. Nevertheless, further experiments are required to decide the matter. Whichever turns out to be the correct explanation for the results of the children with narrow focus interpretation, we can conclude that the fact that some children sometimes access the VP-readings argues agianst a syntactic view of focus.

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Overspecification in Early English

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1. Introduction

After almost 50 years of research in Generative Linguistics, there is little doubt that many properties of human languages are innately determined in our genetic make up. Still, one the most enduring questions is *how much* is predetermined? Baker (2002) discusses two logical ways in which Universal Grammar might be specified in our genetic endowment. One alternative is to say that Universal Grammar (UG) overdetermines the grammar of particular languages. On this view, all linguistic principles and parameters are *known* by the child; she just needs to identify the specific parametric values that define the adult language, and discard the rest. On the other view, some grammatical points are left underspecified, with domain-general learning mechanisms filling in the missing information from the environment (Pinker and Bloom, 1990). In this paper, we study three two-year-old children's acquisition of inflection and negation, and demonstrate that the path of acquisition favours the Overspecified view of Universal Grammar.

The three children in our study produced the non-target sentences like those in (1), along with the adult-like sentences in (2):

(1) a. It fit here
    b. It not fits here
    c. It s not fit here

(2) a. It fits here
    b. It doesn't fit here

According to the Underspecification view, some aspects of grammar are learnable from environmental input using general cognitive processes and consequently those values need not be specified in UG (cf. Elman, 1999). One prediction that this model makes is that children are tightly bound to the linguistic input they hear, never exploring possibilities that are not expressed in the primary linguistic data. This approach assumes that one does not need to write *parametric options* into UG. At first glance, such a theory is preferable given that it is more parsimonious than a theory that assumes that everything is already innately encoded. Non-target sentences like those in (1) are not easily explained on this view, however.

The Overspecification view, by contrast, assumes that all the values for the properties that define the target language are already *known* by the child. On this view, the examples in (1) would be derived by a (slightly) different set of values from the values that determine the derivations in (2), with no further distinctions between adult grammars and child grammars. Thus, this view is compatible with the Continuity Hypothesis (Crain, 1991; Crain and Pietroski, 2002; Pinker, 1984). According to the Continuity Hypothesis, child grammars differ from the target

grammar only in ways adult languages differ from each other, while "the non-grammatical cognitive mechanisms (…) and manner of grammatical realization for children are qualitatively (though not necessarily quantitatively) the same as those for adults" (Pinker, 1984:10). Together with an Overspecified UG, one could explain the variations attested in (1) purely in parametric terms. This view of UG could also be argued to be desirable on grounds of parsimony, given that no further explanation is required to account for the grammatical differences between adults and children.

The next section outlines the Principles and Parameters framework (Chomsky 1995; Lasnik 1995a) and two of the parameters we take to define cross-linguistic variation. Section 3 shows that children's variations in (1) fall within the defined parametric space, thus supporting the idea that Universal Grammar makes available the range of values to the child in advance of experience.

2. The Principles and Parameters framework

In the Minimalist framework, linguistic variation is reduced to the values that lexical elements –i.e. functional categories- may select from the system of fixed principles and parameters provided by UG (Chomsky 1995). To account for the variations attested in our data set, we examine the parametric interactions of two functional categories, INFL and NEG. INFL is assumed to be parameterised along the lines proposed by Lasnik (1995a) (but with some modifications), and NEG varies cross-linguistically in whether it is instantiated as a specifier or a head.

It is standardly assumed that the derivation of a sentence is driven by feature checking of functional categories; the latter contain bundles of uninterpretable features that require checking by matching features. Lasnik (1995a) proposes that the INFL category takes one of two values: featural or affixal. A featural value (cf. 3a) triggers verb-movement to INFL, whereas an affixal value (cf. 3b) does not establish a relationship with the verb in the syntax but in the morphology, by means of affix hopping. The featural option can be characterized as a bundle of uninterpretable features that, once inserted in the derivation, trigger verb movement. Affixal INFL is designated on the INFL head, with no further syntactic requirement.

(3) INFL Parameter
   a. When INFL is + featural, a fully inflected verb is inserted into the syntax, and raises to check features in INFL: French, Spanish, English modals and auxiliary verbs (Lasnik 1995a)
   b. When INFL is + affixal, the verb is associated with its inflection in the morphology: English main verbs, Swedish embedded verbs (Lasnik 1995a; Vikner 1995)

Ideally, a category that triggers feature checking –in this case featural INFL- should attract only the feature F, that is, only the agreement or tense features that check the corresponding features of the target. However, very few cases of pure feature movement are attested in language; in most cases, feature checking results in category movement such as verb movement. According to Chomsky (1995: 262-263), category movement is forced by periphery conditions: words whose features are scattered "may not be subject to [PF] rules, in which case the derivation is

cancelled." As a result, languages that select a featural INFL generally move the verb category. Roberts (1998) claims that English auxiliaries 'have/be' are, in fact, instances of pure feature movement. The idea is that, lacking theta roles (Pollock 1989; Roberts 1995), auxiliaries are just bundles of formal features, which move in their entirety to a higher position to check features.

The difference in featural composition between auxiliaries and lexical verbs gives rise to a crucial distinction in English. Although most languages select only one value for INFL (Romance languages, for instance, display uniform verb movement), English INFL is a 'hybrid' category (Lasnik, 1995a). The INFL category maps onto two different lexical elements. A featural INFL [F] triggers movement of auxiliaries and modals that contain the requisite features, as shown in (4). An affixal INFL is morphologically realized only in third person singular contexts by the morpheme [-s], as shown in (5). (In all other present contexts, affixal INFL is realized by a zero morpheme, and in past tense contexts, by [-ed]).

(4) a. The bear $[F]_{INFL}$ $[_{VP}$ can jump the fence]
    b. The bear $[can]_{INFL}$ $[_{VP}$ can jump the fence] (syntactic movement)

(5) a. The bear $[-s]_{INFL}$ $[_{VP}$ jump the fence]
    b. The bear $[-]_{INFL}$ $[_{VP}$ jumps the fence] (morphological merge)

(6) a. The bear $[-s]_{INFL}$ $[[_{NEGP}$ not $[_{VP}$ jump the fence]]
    b. *The bear $[-]_{INFL}$ $[[_{NEGP}$ not $[_{VP}$ jump-s the fence]] (* morphological merge)
    c. The bear $[does]_{INFL}$ $[[_{NEGP}$ not $[_{VP}$ jump the fence]] (do-support)

Morpho-phonological material may affect the relation between the INFL category and a verbal head, and as example (6) shows, the realization of negation can have a deep impact. In natural languages, sentential negation (NEG) is realized in a variety of forms: affixes, verbal forms, negative markers, among others. In English, sentential NEG is realized by means of the negative marker *not*, which sits higher in the phrase structure than the verbal constituent, and lower than INFL. Given that affixal INFL item establishes its relation with the verb in the Morphology, negative markers disrupt the adjacency of the heads to be merged, and so morphological merge cannot apply, as shown in (6b). To avoid stranding the affix, the lexical empty verb *do* is inserted, as illustrated in (6c).

Now, consider Swedish. Swedish is a V2 language in which inflected verbs precede the negative marker *inte* in main clauses. In non-V2 contexts, however, inflected verbs cannot precede negation as shown by (7b); they must follow the negative marker, as in (7a). In that case, inflection surfaces on the verb, despite the presence of the negative element *inte*.

(7) a. Kanske Lena inte köpte en ny bok igår
    Maybe Lena not bought a new book yesterday (Vikner,1995)
    "Maybe Lena didn't buy a new book yesterday."

(7) b. *Kanske Lena köpte inte en ny bok igår
Maybe Lena bought not a new book yesterday
"Maybe Lena didn't buy a new book yesterday."

Abstracting away from V2 effects, what makes Swedish and English different? One could capture the different effects of negation in Swedish and English in parametric terms. We assume that NEG varies parametrically, as in (8):

(8) NEG Parameter
a. NEG is mapped to a head [H] position
b. NEG is mapped to a specifier [spec] position

The effects of this parameter are clearly observed in languages that select affixal INFL (assuming Relativized Minimality (Rizzi 1990)). Morphological merge is blocked by the presence of an intervening head (Halle and Marantz 1993), but not by an intervening specifier (Bobalijk 1995; Lasnik 1995a). Consequently, a grammar that selects a [spec] value for NEG can lower INFL to the verb whereas a grammar that selects a [H] value cannot lower INFL to the verb because adjacency of the verb and INFL is disrupted. If we assume that English and Swedish both select for affixal INFL, we can now explain the difference between (6a) and (7b): Swedish selects a [spec] value for NEG while English selects a [H] value.

The combination of these two parameters related to the functional heads INFL and NEG results in a circumscribed parametric space, shown in Table 1.

	Head	Specifier
Featural	[F, Head]	[F, Spec]
Affixal	[Aff, Head] e.g English	[Aff, Spec] e.g. Swedish

Table 1: Parametric space

It follows that if these are the options specified in an Overspecified Universal Grammar, we might expect children to search these, and only these values, as they converge on the target grammar. On the Underspecified view, children should hypothesize only the [Aff, Head] value that characterizes the adult grammar of English.

3. Longitudinal study of children's grammars

This section proposes that the non-adult sentence types reported in (1) can be accounted for by the Overspecification account. The claim is that children's non-adult utterances reflect their attempts to set the correct values for the parameters in question. Hence, we expect the non-adult variations to be constrained by interactions of the INFL and NEG parameters as defined in Table 1 previously. Provided that children *know* more UG options than the ones that determine the target language, it is logically possible that children may temporarily assume the wrong value set.

3.1 The data

Longitudinal data were collected from three children (C.M. (1;9-2;8), C.W. (2;0-3;0) and SL (1;10-2;8)) using elicited production techniques (Thornton 1996) over a period of about a year. During the sessions, held every two weeks whenever possible, affirmative and negative sentences in simple present contexts with singular subjects were targeted. A total of 1553 affirmative sentences and 188 negative sentences were collected, among these, a considerable number of utterances not observed in adult speech.

The data set contained 495 affirmative utterances with omissions of inflection, as in (9a), and 885 affirmative utterances with inflected verbs, as in (9b). We also observed 173 affirmative utterances with a non-adult morphological realization of INFL of the kind in (9c). The lexical verb appears uninflected, and the morpheme [-s] surfaces between the subject and the predicate. Note that the extra [-s] cannot be a plural morpheme on the subject; it is found with singular pronominals *he*, *she* and *it*, proper names as in (9c) and (9d), a variety of singular nominal expressions like *this one*, and also quantificational elements like *everyone*. Hence the *displaced* morpheme is taken to be the realization of singular verbal agreement. In a few cases, the morpheme is duplicated, as (9d) shows.

(9) a. He drink milk
b. He drinks milk every day.
c. June s eat pizza
d. Pooh s likes pizza

The same patterns for INFL are attested in negative contexts. The data comprises 59 negative utterances with uninflected verbs, as in (10a), and 21 with inflected verbs, as in (10b). We also observed 10 utterances containing the displaced morpheme [-s] with the negative marker *not* and 11 with the displaced morpheme and *don't*, as illustrated in (10c) and (10d) respectively.

(10) a. He not eat carrots
b. He not eats carrots
c. He s not eat carrots
d. He s don't like carrots

(11) He doesn't eat tomatoes

Few adult-like negative utterances like (11) were observed during the period in which examples like (10) occurred. It was only around the time when the inflectional variants disappeared that children started to use do-support consistently. In all, 87 adult-like negative sentences were elicited from the three children.

3.2 Parametric variations in Early English

This section demonstrates that children's utterances in (9) through (11) derive from the parametric options predicted by Overspecification. The claim is that the

appearance of do-support in children's grammars marks the setting of the INFL and NEG parameters. The appearance of do-support should therefore herald the disappearance of the non-target parametric variations.

It is clear that utterances like (9b) and (11) can be derived in a grammar that selects [Aff, Head], and which has the post-syntactic operation of do-support when a head blocks morphological merge, as in adult English. In our view, the other non-adult utterances reflect children's attempts to find the correct set of parametric values. These options are later discarded in favour of the values represented in the positive data in the environment.

Let us discuss first the two possible grammars that follow from the options associated with the INFL parameter described in section 2. Until the child becomes aware that English has a 'hybrid' INFL, the following scenarios are possible:

(12) The child initially chooses:
   a. an affixal INFL for both modals/auxiliaries and lexical verbs
   b. a featural INFL for both modals/auxiliaries and lexical verbs.

In the first scenario, (12a), the grammar uniquely specifies an affixal value for INFL. INFL is projected as a morpheme, [-s] or [∅], which later lowers to the verb, as in (13a). For modals and auxiliaries, a zero morpheme must be hypothesized, given that *can*, *would*, etc., are free morphemes and cannot act as affixes. In such a grammar, modals and auxiliaries (cf. 13b), could not raise to INFL, contrary to the adult grammar of English. Rather, they should affix to the verb to the right of NEG, giving (in principle) the word order in (14a) and (14b).

(13) a. He $[\text{-}]_{\text{INFL}}$ like-s[Aff] the apple
   b. He $[\text{-}]_{\text{INFL}}$ is∅ [Aff] eating the apple

(14) a. He not is eating the apple
   b. He not can eat the apple

For the second scenario, outlined in (12b), selecting a featural value for INFL requires the verbal features to raise to the INFL node to check off uninterpretable features. A grammar that chooses this value for INFL raises modals and auxiliaries, checking off the features on INFL as in (15a), raising past negation if it is present in the derivation, as in (15b). This featural value of the parameter is correct for modals and auxiliaries, but presents a dilemma for derivations containing lexical verbs, because the verb must remain in the VP in English, as illustrated in (15c).

(15) a. He $[\text{F}]_{\text{INFL}}$ is eating the apple → He $[\text{is}]_{\text{INFL}}$ eating the apple
   b. He $[\text{F}]_{\text{INFL}}$ not is eating the apple → He $[\text{is}]_{\text{INFL}}$ not eating the apple
   c. He $[\text{F}]_{\text{INFL}}$ likes the apple → He $[\text{s}]_{\text{INFL}}$ like the apple

Given that English-speaking children appear to know early on that lexical verbs do not move out of the VP (Poeppel and Wexler 1993), it is unlikely that children will attempt to satisfy the checking requirements of INFL by raising the lexical verb. Assuming, however, that the most economical movement operation moves only the

necessary features (Chomsky 1995), one way of satisfying the requirements of INFL is to move the morpheme [-s] independently of the verb. In other words, children could interpret the morpheme [-s] as bundle of formal features, on a par with auxiliaries and modals (Roberts 1995), and generate (15c), moving [-s] to the INFL position in the same way as auxiliaries, as shown in (15a) and (15b). Examples like (9d) have the same derivation but the lower copy remains, undeleted.

Next, we turn to the category status of NEG as specifier or head. Combined with the values of the INFL parameter, we get the four typological variants shown in Table 1 above. Selecting a featural value for INFL, negative markers should not block feature movement regardless of the value selected for NEG, given that it is not a potential checking head for INFL. That is, the auxiliary or modal that contains the features should be able to move across negation. Children did produce negative sentences that can be taken to realize a featural INFL (see section 3.1). Two different negative variants were produced. One of them contains the negative marker *not* (16a); the second, the marker *don't* (16b). For the first case, it is not possible to tell whether NEG is a spec or a head, but *don't* is most likely a head, if one assumes that affixes are the smallest overt realization of a head (see Zwicky and Pullum 1983).

(16) a. He s not eat it
b. He s don't eat it

The result of the parametric choice for NEG can be seen in grammars that select an affixal setting of the INFL parameter. An affixal INFL requires a morphological host in order to avoid the Stray Affix constraint (Lasnik 1981). Consequently, if NEG is mapped to a head position, a morphological mechanism must be implemented in order to satisfy the constraint –do-support in adult English-, as shown in (17a). A grammar that selects [Aff, Spec] can lower the agreement affix over negation, given that specifiers do not block morphological merge, as in (17b).

(17) a. He does not/doesn't fit in the box
b. He not fits in the box.

The forms attested throughout the different sessions can be analysed with respect to the variations predicted by the interaction of two functional categories, as summarized in Table 2 below.

	Head	Specifier
Featural	**[F, Head]** He s don't fit	**[F, Spec]** He s not fit (?)
Affixal	**[Aff, Head]** He doesn't fit	**[Aff, Spec]** He not fits

Table 2: Parametric Values in Child English

The early period in which children appear to be fluctuating between parameter values is also characterized by the absence of do-support in negative sentences. If one assumes that children are systematically analysing the input in search of

generalizations, the absence of do-support is puzzling. If children are trying out parametric values that differ from the adult grammar, the absence of do-support is expected. These variants should disappear once the correct value set is considered.

Below, we chart the development of all (finite) variants for each child with the first productive uses of do-support (Figures 1 through 3). Except for C.M., who only sporadically selects a featural value for INFL, we observe that the emergence of do-support coincides with a decrease in the non-adult utterance types.

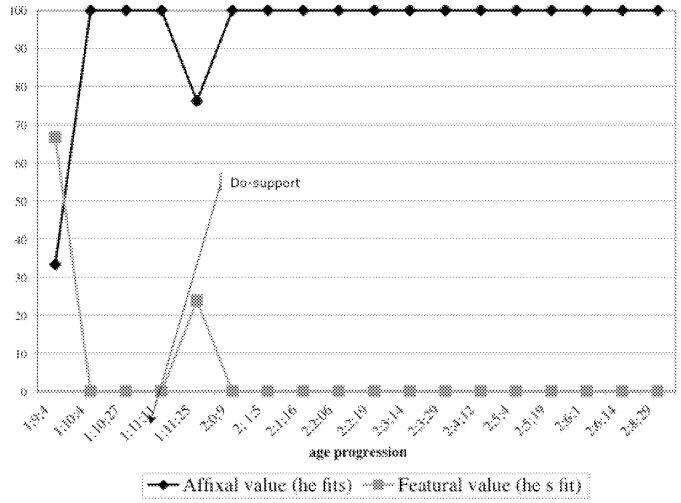

Figure 1: CM's Non-adult Inflectional Variants and Emergence of Do-support

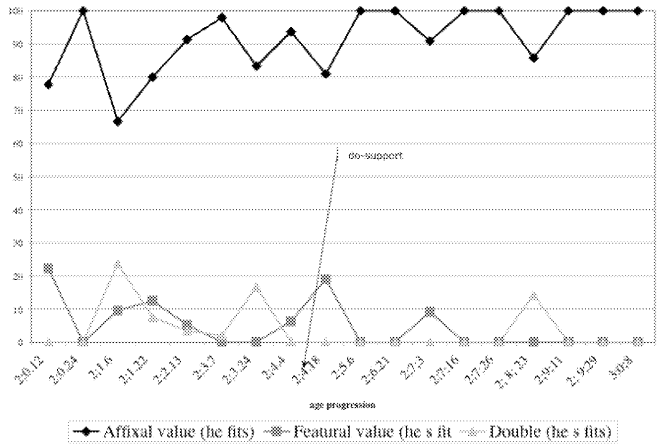

Figure 2: CW's Non-adult Inflectional Variants and Emergence of Do-support

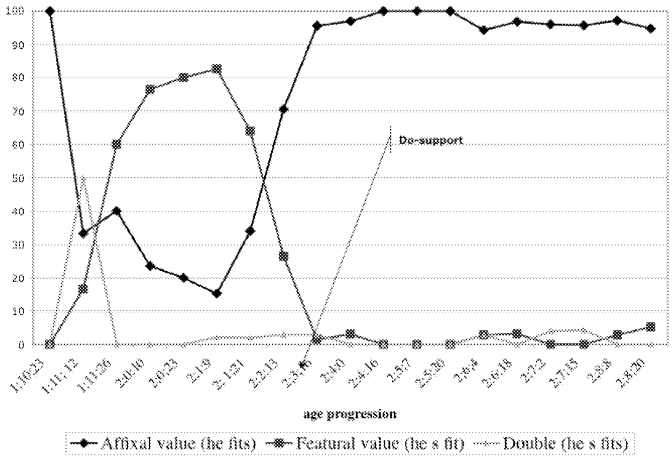

Figure 3: SL's Non-adult Inflectional Variants and Emergence of Do-support

In the next section, we propose a more detailed explanation for the complementary distribution of do-support and these parametric fluctuations. The account is also extended to explain omissions of inflection in children's speech.

3.3 Optional Infinitives and the Emergence of Do-support

We have accounted for children's alternative morphological forms as the product of different combinations of parametric values. However, this account does not explain the omissions of inflection that are documented in the literature and observed in our data also. According to our hypothesis, children know the values of INFL; what they need to figure out is which one of those values corresponds to the grammar of their linguistic community. This is why we only predict parametric variations that fall within the space defined in Table 2 above. If children know the values of INFL, they should know that this category obligatorily maps in the syntax and therefore, it should be realized in PF. In this section, we explain omissions as the consequence of the process of parameter resetting.

According to some current literature, children's deviations from the target, including their failure to use inflection obligatorily, is attributed to an immature grammatical component (e.g., Wexler 1994). On this model, inflection *grows* according to a biological schedule. For Underspecified views of language acquisition, the input plays a larger role. Presumably, failure to use inflection obligatorily would reflect the fact that learning (of the parametric value, or whatever it is that has to be learned) is not complete. According to the Continuity hypothesis however, all principles and parameter values are available to children at all times. If the *wrong* value is chosen, positive data brings about parameter resetting. The problem for this model is that omissions of inflection cannot all be straightforwardly predicted by an incorrect combination of parametric values. We turn to this subject next.

In our view, children's non-target utterances derive from the uncertainty that

ambiguous positive data generates when parameter (re)-setting is required. The usual and optimal way to select parametric values is to assume only one value for each parameter. As discussed in section 2, the INFL category in English is realized by two different elements that assume two different values. So, the usual assumption goes against the positive data to which English-speaking children are exposed. Not only do children need to learn the meaning and properties of specific lexical items (modals, auxiliaries, lexical verbs), they also need to determine the formal properties of *two* different functional items: featural INFL and affixal INFL. If children adopt a *select one value* for INFL, they are bound to notice certain inconsistencies with respect to the input they are listening to. We propose that omissions of verbal morphology, specifically the morpheme [-s] in finite clauses, reflect the uncertainty that ensues given this situation.

Setting the values for the NEG category also introduces uncertainty in children's grammars which may result in omissions of inflection. Our data shows that children initially realize negation by means of the marker *not*, (see also Klima and Bellugi 1966). This may reflect the fact that the child has selected a specifier value for the NEG category. But changing this value to the adult setting may conflict with the INFL settings. A grammar that lacks a (morphological) operation like English do-support while selecting an [Aff, H] value for the two parameters cannot realize INFL since it would result in a violation of the Stray Affix filter. It is somewhat paradoxical that a child who hypothesizes the adult settings for the INFL and NEG parameters, but has not yet acquired do-support, cannot lower INFL over *not* because this would violate the Head Movement Constraint (Chomsky 1995; Travis 1984). A similar situation arises if the child thinks that *don't* is a lexical item indicating negation; the child should fail to affix agreement on to the main verb across *don't*. Failure to lower INFL to the verb is, however, just a morphological violation, which calls for a morpho-phonological solution. Adult English makes use of do-support, but a second option would simply be to *delete* the offending element, or in other words, *not to pronounce* it. In that case, children would be forced to produce "It not fit" or "He don't fit"—with the inflection omitted. Thus, these options could be added to the [Aff, H] cell in Table 2 as possible realizations of this parametric setting.

If a child assumes that modals and auxiliaries select an affixal INFL, utterances like (18a) should inform children that these items move out of the VP, past negation.

(18) a. He is not eating the apple
b. He cannot eat the apple

Word order can help resetting an incorrect affixal value for modals and auxiliaries but it does not provide a solution if the child selects a featural value for lexical verbs. The morpheme [–s] surfaces in the same position even if it raises for feature checking, cf. (19a) and (19b). In addition, the settings of the adult grammar require an extra operation –do-support- that is triggered by the morphological requirements of the affixal value of INFL when a NEG head intervenes with morphological merge. This operation is determined by peripheral conditions and not by core properties of UG.

(19) a. He $[s]_{INFL}$ not like apples
b. He $[does]_{INFL}$ not like apples

Thus, resetting the featural value to affixal is clearly not an economical step in child grammars, but given that do-support *is* part of the input, children eventually need to incorporate this operation into their grammars. Given the semantic emptiness of this operation, it is reasonable to conclude that it might take longer to acquire. It is only when children discover the morphological function of do-support that they can switch the parameter to an affixal value. Once this operation is operative in child grammars, i.e. once children use *doesn't* regularly, uncertainty created by the ambiguous input should disappear and with it all non-adult variations, including omissions.

4. Conclusions

We began our discussion by comparing two different logical architectures of Universal Grammar: Overspecification vs. Underspecification. The Underspecified view predicts that children heavily rely on the data provided by the input, to form their hypotheses about the grammar. On this view, few deviations from the target are expected. Thus, children's hypotheses about inflection and negation should not differ qualitatively from the adult grammar. On the other hand, the Overspecified view predicts a circumscribed number of possibilities that derive from the combination of the INFL and NEG parameters. It is logically possible that children may posit these non-target parameter settings in the absence of experience.

The possibilities manifested by the children in our study are not reflected in the input –for instance, a featural value associated with lexical verbs as in "he s fit" is not observed in adult grammars. Nevertheless, the appearance of these forms in child grammars can be systematically accounted for if we assume that they are the realization of the formal properties that have been conceptually attributed to the functional categories under discussion. Once do-support becomes a productive operation in their grammars, all fluctuations –including omissions- sharply decrease. We have correlated the emergence of this operation with the (final) resetting of the INFL value and NEG value. Assuming that do-insertion is a peripheral operation, we take it as the final indicator that children have incorporated a [Aff, H] value set for these parameters into their grammars.

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On the Role of Aspect in Determining Finiteness and Temporal Interpretation in Early Grammar

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1. Introduction

Over the past several years there has been increasing interest in the temporal and aspectual properties of root infinitive (RI) and other non-finite structures in child language. One generalization that has emerged concerns the relationship between finiteness and the lexical aspect of the verb. Various studies have shown that RIs in languages such as Dutch, German and French are restricted to eventive predicates while statives are typically finite (Ferdinand 1996; Wijnen 1997; Becker and Hyams 2000). Hoekstra and Hyams (1998) refer to this finding as the Eventivity Constraint (EC) on RIs. Based on this earlier work, Gavruseva 2003 develops an analysis of RIs and English bare verbs that purports to derive the RI phenomenon from the aspectual properties of the predicate. We tested Gavruseva's proposal against data from three monolingual English-speaking children (Nina, Naomi, and Sarah in the CHILDES database). In this talk we describe the results of that study. To anticipate our conclusions, we did not find any support for Gavruseva's analysis. We did, however, find a very interesting and unexpected relationship between the inherent aspect of the verbs and their temporal meaning, which we describe in the second part of the paper. We begin by discussing Gavruseva's hypothesis.

2. Aspect and Finiteness in Early Grammar

Gavruseva (2003) proposes an interesting analysis of the RI stage according to which inherent aspectual properties of the predicate such as telicity and punctuality determine which verbs will surface as non-finite and which will not. In a simplification of the aktionsart typology originally proposed by Vendler (1967), Gavruseva proposes a typology of verb classes based on the semantic features of telicity and punctuality. Atelic verbs, as well as punctual telic verbs enter the syntax with their aspect already specified. Thus, statives verbs such as *want, like*, etc. are inherently atelic (they have no intrinsic endpoint) and punctual eventive verbs such as *break, fall, throw* are inherently telic (they have an intrinsic endpoint.). On the other hand, non-punctual eventive verbs such as *write* are "aspectually transient" (Verkuyl 1999). The telicity of these verbs depends on the other elements in the predicate. In other words the telicity is compositionally determined. Thus, with a verb such as *write* the predicate will be telic in a sentence such as (1a) and atelic in a sentence such as (1b). This is because the complement *a book* is a "specified quantity" (Verkuyl 1999) and hence defines an endpoint, while *books* is an unspecified quantity and thus defines no endpoint.

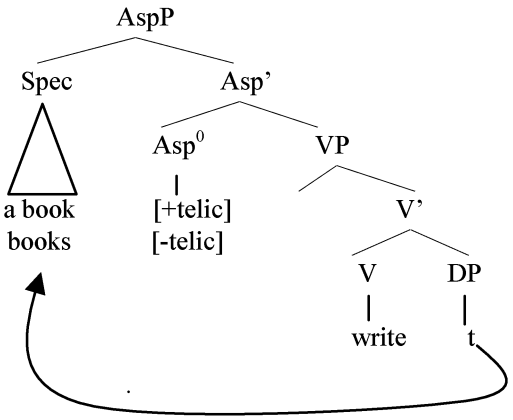
(1) a. John wrote a book.
b. John writes books.

Gavruseva's inventory of aspectual types is schematized in (2)

(2) Statives: V [-telic]
Punctual eventives: V [+telic]
Non-punctual eventives: V [+/- telic]

Gavruseva further assumes, following ideas of Travis (1991), Borer (1994) and others, that telicity is a syntactic feature that is checked by the verb in an AspP projection, as in (3).

(3)



On her account only the non-punctual eventives, which are unspecified for telicity, must move through an AspP projection. Their telicity feature is then determined by the argument in the specifier of AspP. In the tree in (3), the complement *a book* would check a [+telic] feature while *books* would checks a [-telic] feature.

Gavruseva's final set of assumptions concerns the role of AspP in the temporal specification of the sentence. She assumes that the temporal interpretation of the clause is given by a tense chain (à la Guéron & Hoekstra 1989) of which AspP is a member. RIs result when Asp is underspecified and a tense chain cannot be formed. Gavruseva's various assumptions lead to the prediction that statives and punctual eventives, both of which are inherently specified for telicity, will always license a tense chain, and that non-finite clauses, RIs and bare verbs, will be restricted to non-punctual eventives since these require a grammatical specification of Asp to license a tense chain. These predictions are summarized in (4).

(4) a. statives (e.g. *love, belong , need*) are finite
b. punctual eventives (e.g. *break, fall, throw*) are finite.
c. non-punctual eventives (e.g. *write, paint, draw, run*) are non-finite.

Henceforth, we refer to Gavruseva's proposal as the 'telicity hypothesis.' Gavruseva 2002 reports that the telicity hypothesis correctly predicts the distribution of finite and bare verbs in the English L2 acquisition of an 8-year old Russian-speaking child named Dasha. According to Gavruseva, Dasha's English data showed a strong tendency for punctuals to have past tense marking while non-punctuals were

much less likely to be so-marked. Overall, 68% of Dasha's punctuals were marked with past tense morphology as opposed to only 19% of the non-punctuals. Statives were not considered (we return to this point below). These figures are reported in table 1.

	Punctual	*Non-punctual*
Files 1-3	100% (6/6)	0% (0/4)
Files 4-10	66% (48/73)	21% (7/33)
Total	68% (54/79)	19% (7/37)

Table 1: Proportion of finite (*-ed*) punctual and non-punctual verbs: Dasha (based on Gavruseva 2002; table 10)

3. L1 English and the Telicity Hypothesis

In a very influential paper, Wexler (1994) proposed that bare verbs such as those in (5) represent the English analogue of the root infinitive

(5) a. He lose it (Sarah, file 40)
b. He fall down (Sarah, file 40)
c. Play ball with him (Nina, file 39)

In analyzing Dasha's data, Gavruseva follows Wexler's hypothesis for L1 acquisition. This is not an uncontroversial hypothesis for L2 acquisition. Hazdenar and Schwartz (1997), for example, argue that the English bare verbs in the Turkish child they studied were actually finite verbs that lack inflection. Their claim is based on the fact that the bare verb sentences showed finite syntax, for example subjects were invariably overt and marked with nominative case. Ionin and Wexler (2002) report similar results for Russian children acquiring English.

In our study we tested the predictions of the telicity hypothesis in English L1 acquisition. We looked at the distribution of inflected and bare verbs in the longitudinal data of 3 children. The ages and files of the children we examined are given in table 2.

	Age	*Files*	*Source*
Nina	2;11-3;0	39-45	Suppes 1971
Naomi	2;11-3;5	74-86	Sachs 1970
Sarah	2;11-3;3	39-53	Brown 1973

Table 2: Ages and files of subjects[1]

We counted all non-copular verbal utterances with 3rd person subjects (either overt or implicit). Each verb was coded as an *–s* form, bare form, or past form (regular or irregular). In addition, verbs were classified according to aspectual type,

[1] The data are from the CHILDES data-base (MacWhinney and Snow 1985)

stative or eventive, and within the eventives, verbs were further broken down into punctual and non-punctual. We determined the lexical aspect of the verbs using the standard tests for aspect, such as whether they could be modified by adverbial phrases such as *in x time*, *for x time* (cf. Smith 1997). Stative verbs, punctual, and non-punctual eventives were all represented in our data. The total number and percentage of verbs in each aspectual class for each child is given in table 3.[2]

	Aspectual Class			
	Stative	*Punctual*	*Non-punctual*	*Total*
Nina	58 (50%)	34 (29%)	25 (21%)	117
Naomi	32 (58%)	13 (24)	10 (18%)	55
Sarah	30 (38%)	29 (37%)	20 (25%)	79
Total	120 (48%)	76 (30%)	55 (22%)	251

Table 3: Frequency of different aspectual classes:
finite and non-finite (bare) verbs

3.1. A methodological point

Before turning to the predictions in (4) and our results, we take a brief methodological detour. In analyzing Dasha's data, Gavruseva considered only finite verbs with past tense morphology. Although the telicity hypothesis makes predictions about finiteness, and hence also about the present tense forms, Gavruseva excluded verbs marked with 3rd person *–s* from her analysis. The rationale for this exclusion is twofold (see Gavruseva 2002, p. 122, note 13). First, she notes that the present tense *-s* has a limited distribution in that it occurs only in 3rd person contexts. Second, Gavruseva suggests that children may overgeneralize the "null" 1st and 2nd person morphology to 3rd person contexts, in which case the bare forms with 3rd person subjects could actually be finite forms that simply lack morphology. This would be analogous to what Hazdenar and Schwartz (1997) claim is the case for the L2 Turkish child they studied, discussed in the previous section. However, if Gavruseva is willing to allow for the possibility that bare forms in Dasha's data are really finite forms that lack overt morphology, this obviously calls into question all her findings with respect to tense marking, which involve a comparison of bare vs. overtly marked forms.

In this paper we take no position with respect to the status of RIs and bare forms in L2 acquisition since we are concerned with L1 English acquisition. However, Gavruseva 2003 argues that –s forms should also be excluded from the analysis of L1 English for the same reasons (Gavruseva 2003, p 748, section 4.1). We believe, however, that the exclusion of *–s* forms from the L1 data engenders several methodological and empirical problems. First, by ignoring present tense verbs, Gavruseva also severely limits the contexts that can be studied. In particular, she ends up excluding statives, which rarely occur in the past tense in the children's data and which constitute a huge proportion of the early verbs. In our data, for example,

[2] There were 51 eventive verbs/predicates that could not be classified with respect to punctuality. These are excluded from tables 2, 4 and 5.

48% of the children's verbs during the RI period were stative. (We return to this shortly (cf. section 3.2)).

With regard to the overgeneralization issue, we know from studies of other languages that children rarely if ever overgeneralize agreement (agreement errors are under 4% across languages - cf. Hoekstra and Hyams 1998 for review). We see no reason why L1 English acquisition should differ in this regard from the other languages that have been studied. Indeed, as discussed in Hyams (2001), there are interesting interpretive differences between English finite and bare verbs. Table 4 presents the breakdown of bare and finite verbs according to their temporal reference.

	Finite (*-s*) verb			Bare verb		
	ongoing	*habitual*	*past*	*ongoing*	*habitual*	*Past*
Nina	0	16(100%)	0	8 (35%)	3 (13%)	12(52%)
Naomi	0	7 (89%)	1(11%)	2 (40%)	0	3 (60%)
Sarah	0	10 (100%)	0	5 (16%)	5(16%)	22(68%)
Total*	0	33 (97%)	1	15(25%)	8(13%)	37(62%)

Table 4. Aspectual/temporal interpretation of bare and finite *(-s)* eventive verbs in English (Nina 2;11-3;0, Naomi 2;11-3;5, Sarah 2;11-3;3)[3]

We see in table 4 that the overwhelming proportion of *–s* marked verbs (97% averaging across children) have a habitual or property reading in early English. Thus, in child English as in the adult language, present tense *-s* does not occur in ongoing event contexts. On the other hand, averaging across children, only 13% of bare verbs occur in habitual contexts, while more than 25% occur in ongoing event contexts. Thus, the bare forms have a much broader distribution than the –s forms. In the second part of this talk we will provide an explanation for this result. At this point we wish merely to point out that since finite verbs do not occur in ongoing contexts, the overgeneralization hypothesis fails to provide a source for a quarter of the bare verbs. It seems unlikely therefore that the L1 bare forms are really hidden finite forms, as suggested by Gavruseva.[4]

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[3] There were 3 *-s* verbs and 1 bare verb whose temporal/aspectual meaning could not be determined

[4] The aspectual interpretation of the children's verbs was determined based on (a) adverbial cues, e.g. *now, always,* etc, (b) surrounding discourse, (c) parental response/repair, (d) non-linguistic context. Indeterminate cases were not included in the counts. The sentences below illustrate the various interpretations of the bare form.

(i)	Mother:	What's she doing with the tiger now?		
	Child:	Play # play ball with him	Ongoing	(Nina file 44)
(ii)	Child:	The walrus bite?		
	Mother:	No, the walrus doesn't bite.	Property/habitual	(Nina file 39)
(iii)	Child:	Somebody draw here.		
	Mother:	Yes# mommy did when mommy was a little girl #honey	Past	(Naomi file 77)

Our most serious objection to the exclusion of present tense verbs, however, is that by considering only past tense verbs, Gavruseva inadvertently stacks the deck in favor of the telicity hypothesis. This is because non-punctual verbs occur disproportionately more often in the present tense, as we will see. Thus, by excluding present tense finite verbs it will necessarily be the case that punctual verbs are more occur in finite form more often than non-punctuals. For these various reasons in our own analysis of the L1 data we follow the standard procedure for English. We restrict our analysis to sentences with 3rd person singular subjects and count both *–s* and *–ed* as finite and bare forms as non-finite.

3.2 The L1 study

Turning now to the predictions in (4), we report the results of our investigation in tables 5-7. With regard to the prediction in (4a), that stative verbs will be finite, we see in table 4 that this appears to be confirmed for 2 of the 3 children.

	Stative verbs		Eventive verbs	
	Finite	*Bare*	*Finite*	*Bare*
Nina	50 (86%)	8 (14%)	62 (73%)	23 (27%)
Naomi	30 (94%)	2 (6%)	28 (85%)	5 (15%)
Sarah	11 (37%)	19 (63%)	29 (47%)	33 (53%)
Total	91 (76%)	29 (24%)	119 (66%)	61 (34%)

Table 5. Proportion of finite (*-s*, *-ed* forms) and non-finite (bare) stative and eventive verbs

For Nina and Naomi the majority of statives were finite, 86% and 94%, respectively. However, in these children's data the eventive verbs are also heavily skewed toward finite - 73% and 85% of eventive verbs were finite for these two children. We cannot therefore conclude that there is an effect of aspect. Equally important, however, is the fact that Sarah's results go in the opposite direction - bare statives outnumber finite statives, and this is also true of her eventive verbs. Overall, then, stativity does not seem to affect finiteness disproportionately, as would be predicted by (4a). Indeed, averaging across children almost a quarter of the statives are bare (e.g. *Eve want that*), contra the prediction in (4a).

Prediction (4b), that punctual verbs are finite, is also not confirmed. As shown in table 6, the rate of bare punctuals (e.g. *Oh, he fall down*) for Nina, Naomi and Sarah was 35%, 23% and 63%, respectively. Collapsing across the 3 children, 43% of punctual verbs are bare.

	Finite		*Bare*	
	N	%	N	%
Nina	22	65%	12	35%
Naomi	10	77%	3	23%
Sarah	10	37%	17	63%
Total	42	57%	32	43%

Table 6. Proportion of finite (*-s*, *-ed* forms) and non-finite (bare) punctual verbs[5]

With regard to prediction (4c), that non-punctuals are non-finite, we found that non-punctuals do indeed occur in non-finite form, but that they do less often than the punctual verbs. Table 7 shows that overall, the proportion of bare non-punctual verbs is 33%, as compared to the 43% bare punctuals in table 5. Thus, this last prediction is also not supported by our data.

	Finite		*Bare*	
	N	%	N	%
Nina	21	84%	4	16%
Naomi	9	90%	1	10%
Sarah	7	35%	13	65%
Total	37	67%	18	33%

Table 7. Proportion of Finite (*-s*, *-ed* forms) and bare non-punctual verbs[6]

Gavruseva notes that in Dasha's data the past tense morpheme is initially restricted to punctual verbs (the first 3 files), as shown in table 1. This is consistent with the findings of Shirai and Anderson 1995 and Olsen and Weinberg 1999, who observe that L1 English-speaking children (Adam, Eve, Naomi) initially restrict the past tense marker to punctual verbs (achievements verbs in Vendler's sense) and only later extend it to verbs of other aspectual classes. Such 'aspect first' effects, that is, the overly restrictive use of certain tense/aspect morphemes, are a well-known property of early language.[7] However, the telicity hypothesis does not predict an initial restriction of *–ed* to telic predicates. Rather, it predicts that the bare verbs throughout the RI stage will be non-punctual eventives. As we have seen in tables 6 and 7, however, there is no difference between punctuals and non-punctuals with respect to the proportion of finite verbs. Overall, then we have found no support for the telicity hypothesis in our data.

[5] 36/42 (86%) of the finite punctuals were *–ed* forms.

[6] 23/37 (62%) of the finite non-punctuals were *–ed* forms

[7] See Shirai and Anderson (1995) and Wagner (1999) for review of relevant literature and Olsen and Weinberg (1999) for a learning theoretic account. A more detailed discussion of this issue is beyond the scope of this paper.

4. Aspect and temporal interpretation of non-finite forms

While we did not find a relation between lexical aspect and finiteness, our results did show a clear correlation between lexical aspect and the temporal reference of the English bare verb, i.e., whether the verb denoted a past or non-past event. In table 4 we saw that bare verbs could have either present or past tense reference. When we break down the bare verbs according to telicity, we find that, averaging across children, 73% of telic bare verbs, such as in sentences (5a,b), refer to past eventualities, while 86% of the atelic bare verbs refer to non-past eventualities (e.g. 5c). These results are reported in table 8. The contingency between telicity and temporal reference is highly significant by chi-square test: $\chi^2(1) = 14.3$, $p < .01$.

	Temporal interpretation		
	Past	*Non-past*	*Total*
Telic	27 (73%)	10 (17%)	37
Atelic	2 (14%)	12 (86%)	14

Table 8. Temporal reference and (a)telicity of eventive bare verbs (Nina, Naomi, Sarah)[8]

Table 8 includes only eventive verbs. If we also include in the atelic category the statives (cf. table 3), the contingency is even stronger, as shown in table 9. The results are highly significant by chi-square analysis: $\chi^2(1) = 40.2$ $p < .01$.

	Temporal interpretation		
	Past	*Non-past*	*Total*
Telic	27 (73%)	10 (17%)	37
Atelic (incl. statives)	2 (5%)	41 (95%)	43

Table 9. Temporal reference and (a)telicity of all bare verbs (Nina, Naomi, Sarah)[9]

It is striking that our results are parallel to those obtained by Brun et al. (1999) for early Russian. Russian verbs come in perfective-imperfective pairs. Brun et al. found that the grammatical aspect of Russian RIs correlates with the temporal interpretation: perfective RIs typically have a past meaning while imperfectives RIs denote ongoing eventualities. Brun et al. interpret their results as showing that in the absence of tense, grammatical aspect serves as a temporal anchor (cf. also Becker 2000). Our results seem to go one step further and suggest that when neither Tense nor grammatical Aspect is morphologically specified, inherent aspect, that is, telicity, provides the temporal reference for the clause.

This temporal dependency on the telicity of the predicate does not appear to be an idiosyncratic property of child language. Lin 2002 discusses the temporal interpretation of what he calls "bare" sentences in (adult) Chinese, sentences that

[8] There were 10 predicates whose telicity could not be reliably determined.
[9] There were 15 stative verbs whose temporal meaning was indeterminate.

lack aspectual markers and temporal adverbs. Abstracting somewhat, the descriptive generalization is that Chinese bare sentences can have either a past or non-past (present/generic-habitual) interpretation. Stative adjectives, stative verbs, modal/auxiliary verbs, and activity verbs (+ locative PP) receive a non-past interpretation. Otherwise, the verb is interpreted as past. Examples are provided in (6) (from Lin 2002).[10]

(6) *Present*

a. Wo xiangxin ni Atelic/stative
I believe you
"I believe you"

b. Ni da lanqiu ma Atelic/activity
you play basketball Q
"Do you play basketball?"

Past

c. Ta dapuo yi ge hua ping Telic/achievement
he break one CL flower vase
"He broke a flower vase"

d. Ta zai Shanghai chu-sheng Telic/achievement
he in Shanghai give-birth
'He was born in Shanghai"

The parallel with the English bare verb is clear. In Chinese bare atelic verbs (i.e., states and activities) are interpreted as imperfective or non-past. Bare telic (i.e. achievements and accomplishments) verbs are interpreted as perfective or past.

5. Conclusion

In this paper we have explored the role of aspect in determining finiteness and temporal interpretation in early grammar. The results of our analysis of the three native English-speaking children in the RI, or more appropriately, bare verb stage, revealed no relation between inherent aspect of the early verbs and their finiteness, contrary to the predictions of the telicity hypothesis (Gavruseva 2002, 2003). On the other hand, we did find a very strong relation between lexical aspect of the verbs and their temporal reference. While space limitations prevent us from providing a detailed analysis of this relation, we believe that the formal properties of this relation will be very similar to those of the adult Chinese bare verb construction, whose temporal reference is also sensitive to the actional properties of the predicate.

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[10] In this respect the bare verbs pattern partially like aspectually marked verbs. Chinese does not have tense markers, but it has perfective (*le*) and imperfective (*zhe, zai*) particles. There are strong aspect/aktionsart correlations in Chinese: the imperfective particle occurs with atelic predicates (*zhe* for stative verbs/*zai* for activity verbs) and the perfective particle with telic predicates (Ping 1989). In this respect as well there is a parallel with child language where we find 'aspect first' effects, that is, past/perfective morphology tends to appear on telic verbs while progressive/imperfective morphology occurs most often on atelic predicates. See footnote 7.

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Why Children Omit Clitics in Some Languages but not in Others: New Evidence from Greek [1]

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1. Introduction

In this paper we investigate developmental properties of direct object clitics across languages, in particular the status of clitic omission in child Greek. Our focus is whether clitic omission is a universal stage that all children speaking a clitic language go through or this holds only for some languages. If the later is the case (as clearly stated in the title) then the question is how we can account for these differences among clitic languages. The theory we are developing here is a further attempt to unify universal properties of development across constructions, including object positions as well as subject positions (see Wexler, to appear). In particular, by unifying the Optional Infinitive (OI) stage with the Clitic Omission Stage (ClO), we are able to explain the apparent variation in the development of pronominal clitics across languages by showing that this variation can be accounted for, if we adopt the same assumptions that are needed in order to explain the facts of the Optional Infinitive stage; that is, the interaction of a universal developmental constraint (the Unique Checking Constraint) with the particular syntactic properties of types of languages.

There are several hypotheses in the literature concerning which aspects of grammar cause the omission of object clitics, including difficulties in forming A-chains (Guasti 1993/94, extending Borer and Wexler's 1987 work on maturation of A-chains), or children's inability to always form a full-fledged clausal structure, i.e. truncated clause structure (Hamann, Rizzi and Frauenfelder, 1996; Haegeman 1996), or problems in coping with Multiple Spell-Out operations (Avram 2000). We do not have space here to show why each of these proposals is inadequate, but simply note that none of them can explain the cross-linguistic variation in omission that we discuss. Our proposal, following Wexler (to appear) and Wexler, Gavarro and Torrens (2003), is that clitic omission and its cross-linguistic variation stem from some universal principle that prevents children from carrying out certain computational processes of syntax, namely the Unique Checking Constraint, that applies to the Grammar as a whole and allows children to accept and produce ungrammatical constructions. Therefore, under this view, clitic omission results from constraints that are principles in children's grammar and not imperfections. Basically, children's grammar is more highly constrained than adult grammar.

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In Section 2, we begin with a summary of the main properties of the normal development of clitics. In Section 3, we lay out the theoretical framework which our hypothesis is built on. Section 4 reviews data on omission of clitics in French and Italian while in Section 5 we present our Greek naturalistic and experimental data that contrast to the Italian and French data presented in Section 3 in informative ways. In Section 6 we conclude and raise some unanswered issues for further discussion.

2. Developmental properties of object clitics

In normal development in many languages, object-clitics have the following properties:

(1) *Properties of object clitics:*

a. Object clitics are never misplaced, that is they never appear in the wrong position with respect to the verb[2], as illustrated in example (2) below. This seems to be true in all languages studied, in particular French, Italian, Greek and Spanish.

(2) To ftiahno (Mary, 1;9) vs *ftiahno to
It-cl-acc make-1st sing-indicative V-indicative-cl
'I'm making it".

b. In early periods clitics are quite rare, as a percentage of grammatical objects overall. Even when the object is not omitted, young children use non-clitic objects at a rate much larger than older children or adults.

c. Clitics are often omitted from structures in which they are obligatory as in the examples (3) and (4) from Greek. This property seems to be parameterised, despite the fact that in all languages studied there is at least some low percentage of clitic omission as (3) and (4) suggest[3]; Wexler, Gavarro and Torrens (2003) have shown that children omit object clitics in Spanish much less often than in French or Italian, and we will show that children also omit object clitics in Greek much less often than in French or Italian.

(3) Sikose __(Mary 1;9) Sikose *to* (target utterance)
Lift-2nd-sing-imperative (it-cl-acc)
"Lift it".

[2] We take no position on questions concerning clitic clusters. It has been claimed (Clark 1985) that French children often violate the relative order of two clitics.

[3] In Modern Greek clitics follow Imperative (as in (5)) and Gerunds and precede Indicative (as in (6)) and Subjunctive. However, the position of the clitic does not relate to their omission or lack of it.

(4) __ thelo (Spiros, 1,9) *to* thelo (target utterance)
(It-cl-acc) want-1st sing-indicative
"I want it".

d. The age at which the clitics are omitted is roughly the same age at which children show Optional Infinitive effects (roughly until three-years of age).

The term clitic omission involves two issues; on the one hand omission of object clitics after they appear in children's speech and on the other hand, extremely low use of clitics at the age of 2-3 (same age as Optional Infinitive stage) in some languages (Italian/French), while frequently used in others (e.g. Greek).

The question arising from (1d) concerns the correlation between clitic omission and the Early Non-Finite verb form. Studies on the acquisition of clitics in Romance and Germanic languages have provided evidence for the generalization that the omission of clitics and the use of optional infinitives occur in the same age-range (Wexler 1998, 1999). For example, Guasti (1993/94) has provided evidence that Italian children omit object clitics during the age-range that corresponds to the optional infinitive stage.

Moreover, Dutch children omit clitic subjects and objects in sentences involving optional infinitives (Haegeman 1996), which shows directly that both phenomena occur at the same age.

It is crucial to note that whether or not children developing language L omit clitics is independent of whether or not children developing L goes through the OI stage. We know that many languages go through the OI stage and many don't. And we now know that many languages go through the Clitic Omission stage and many don't. The two properties are not correlated within a language. For example, Italian does not go through the OI stage but it does go through the Clitic Omission stage. Spanish does not go through the OI stage and it also does not go through the Clitic Omission stage. The UCC theory explains why this is so.

3. The theoretical background: The Optional Infinitive Stage and The Unique Checking Constraint

The theory of Optional Infinitives in normal children has been the subject of much investigation; the Unique Checking Constraint attempts to capture a wide variety of empirical phenomena in clausal development in terms of a simple theory of development and to account for cross-linguistic differences with respect to these phenomena. In this research we attempt to also capture the variety and the cross-linguistic differences with respect to object properties. Before we enter the discussion of how these two correlate, we need to explain some basic properties of the OI Stage and the UCC.

In a nutshell, the basic properties of the OI Stage (Wexler 1990 ff.) can be summarised as follows:

(5) *OI Stage Properties*
   a. Root non-finite sentences are produced
   b. Finite sentences are produced in the same time period
   c. Nevertheless children know the grammatical properties of finiteness and non-finiteness.
   d. In English, children produce non-NOM subjects (e.g. him go), as well as NOM subjects (he go, he goes) but don't produce non-NOM subjects when agreement is present (*him goes).

In order to account for the puzzling facts above, Schutze and Wexler (1996) developed the Agreement/Tense Omission Model (ATOM). We don't have space here to explain how this works, but the original papers and many others do.

(6) *ATOM*
   a. Children in the Optional Infinitive stage omit either AGRS or TNS or neither
   b. Children know the morphological features, e.g. that –s in English is [+3rd, +sing, +present tense]
   c. Children insert inflectional features according to the correct model of morphology (Distributed Morphology, Halle and Marantz, 1993)

Wexler (1996, 1998) attempts to explain the variation that seems to hold among languages with infinitives as far as OI stage is concerned and the null subject parameter. As stated in (7), the generalization that holds is:

(7) *The Null Subject/Optional Infinite Correlation (NS/OI)*
   A language goes through an OI stage if and only if the language is not an INFL-licensed null-subject language.

The problem that arises is to derive ATOM together with NS/OI. The theory that can capture the essence of both is the Unique Checking Constraint (Wexler 1998):

(8) *Unique Checking Constraint* (UCC)
   The D-feature of a DP can only check against one functional category[4].

(9) Minimize Violations (MV)
   Given an LF, choose a numeration whose derivation violates as few grammatical properties as possible. If two numerations are both minimal violators, either one may be chosen.

The UCC explains that AGR-S or TNS is omitted, because they both have an uninterpretable D-feature that must be checked. This violates that UCC, causing omission of AGR-S or TNS. MV together with UCC derive the optionality property

[4] The D-feature is essentially what checks the EPP feature. So an equivalent way of stating the UCC is: a DP can check the EPP feature of at most one functional category.

of the OI stage: since elimination of AGR-S or TNS is a violation, eliminating one of them, competes with a numeration which eliminates no functional categories, deriving an adult well-formed finite expression, but violating UCC. Thus ATOM is derived. NS/OI is derived on the natural assumption that AGR-S has a [+interpretable] D-feature in null-subject languages like Italian, so that the D-feature of AGR-S doesn't have to be checked. The UCC is thus not violated, and there is no reason to omit AGR-S or TNS, thus no need for non-finite root sentences.

3.1 The UCC Derives the properties of Clitic Development-The Hypothesis

Following Wexler (2000), we take the omission of clitic to follow from the Unique Checking Constraint. The fundamental idea is that there is double D-checking in the derivation of the object clitics in some languages (i.e. French, Italian) while there is single D-checking in others (i.e. Greek, Spanish). We assume that the essential double D-checking occurs when participial agreement is present in a language (see also Wexler, Gavarro and Torrens 2003 for a full discussion concerning Spanish versus Catalan). Before we explain the details of the theory of the correlation that we make between participial agreement and clitics, we need to present certain facts that seem to hold through the Clitic Omission Stage.

(10) *Properties of Clitic Omission Stage*

a. Object clitic arguments are often omitted
b. In the same period object clitic arguments are sometimes produced
c. The participial agreement is sometimes omitted in the same period
d. Children know that clitics have to agree with the participle agreement, while the full DP objects do not

The fundamental idea of Wexler's (2000) analysis is that there is double D-checking in the derivation of Romance object clitics; thus the UCC forces the omission of a functional clitic category (containing an uninterpretable D-feature) which is necessary for the realisation of the clitics. Omitting this functional category forces the clitic to be omitted.

Following Sportiche (1996), we assume that the clitic is base generated in the Clitic Phrase (ClP). We take the clitic to be the head of ClP. We furthermore assume that the DP-object *pro* has to check its D-feature with the Clitic Phrase. The clitic must get case or be checked for case (ACC, DAT) so we assume that *pro* first moves through AGR-O, where it checks case. Moreover in Italian and French, a participle agrees (shows surface agreement) with the object clitic. This agreement is presumably checked in AGR-O, by *pro* showing spec-head agreement with the head of AGR-O. When *pro* reaches ClP, it will also have to agree with the clitic there, so we see how the agreement properties of the clitic with the participle are transmitted to the clitic through *pro*.

The movement of pro to AGR-O and then to the clitic phrase is motivated in each case by an uninterpretable feature (the *D* or *EPP* feature) on a functional category, which is checked and eliminated, and spelled out as the appropriate agreement (including case).

UCC prevents children from double checking. In the spirit of the UCC's explanation of the OI stage, the functional category containing one of these D-features must be eliminated, either ClP or AGR-O, so that the UCC isn't violated. If clitic phrase is eliminated then the derivation does not crash, but the clitic cannot be spelled out, since it is generated in the clitic phrase; *pro* can still move to the AGR-O and check its case features. So elimination of ClP results in an omitted clitic, in a derivation which does not crash but violates one Interface property, the requirement of ClP in this construction. The surface effect is that there is an "omitted clitic" (10a). If AGR-O is eliminated then the case feature on *pro* can't be checked. In principle *pro* could move to ClP directly. One possibility is that *pro* (and thus the clitic) gets "default case", if this is a possibility for clitics in a language (paralleling the default case assumed by Schutze and Wexler for non-clitic DPs). The implication would be that when AGR-O is omitted there would not be an omitted clitic, but there would be "case errors." For example, if default case of clitics turned out to be ACC, we would expect some dative clitics to turn up as ACC. We have not investigated this possibility. But we note that if AGR-O is omitted, then participial agreement can't take place, deriving (10c). On the other hand, if there is no possibility of default case for clitics, then there would be no case on *pro* to agree with the clitic, and the whole derivation would crash. In either case, we have the possibility of omitted clitics when ClP is omitted.

By Minimize Violation, sometimes neither ClP nor AGR-O are omitted, and clitics appear normally (10b). Thus UCC predicts the properties of the clitic omission stage.

3.2 Cross-Linguistic Differences: Spanish/Greek versus Italian/French

Spanish and Greek, unlike Italian and French, do not show agreement of the participle with the clitic, although this is not a morphological fact about these languages (Iatridou 1995). Spanish participles can agree, e.g. in predicate adjective constructions. Kayne (1993) proposes that Spanish does not have AGR-O, in order to account for these facts. If that were true, then *pro* does not move through AGR-O and does not check anything in AGR-O, which does not exist. Thus there is only one checking, and UCC is not violated, and there is never a reason to omit ClP. Thus ClP is not omitted and we have derived why Spanish does not show clitic omission, as Wexler (2000) argues. However Wexler points out that it is hard to say that AGR-O is actually missing. How does case on the clitic get checked? We assume instead that in Spanish, AGR-O has a [+interpretable] D-feature. *pro* undergoes long distance agreement with AGR-O in order to check a case feature on AGR-O, but the D-feature of AGR-O does not attract *pro*, since that feature is [+interpretable] and does not have to be eliminated.

The necessary assumption is that agreement is only spelled out if a D-feature on the functional category is checked/eliminated. This is equivalent to or follows from recent work by Guasti and Rizzi which shows that morphological spell-out of features often takes place only under surface movement (not LF-movement in their sense or long distance agreement in current Minimalist discussion). It is the [-interpretable] feature (thus movement inducing) nature of the D-feature of AGR-O in Italian and French that causes the spell-out of agreement on the participle.

Therefore, since there is only one D-checking (by ClP, but not AGRO) in the derivation of Greek and Spanish clitics, there is no violation of UCC, and thus no omission of ClP, and thus no omission of clitics.

Again, we have derived variation across languages (clitic omission or not) as a consequence of the universal developmental constraint (UCC) interacting with the properties of the language, known to the child. Note that there is good evidence that Italian kids at a very young age know that participles agree with clitics. Greek or Spanish children never try to make that happen. So it is fair to claim that children know the parameter (just as we know that children know the null-subject parameter): the interpretable D-feature in AGR-O in Greek and Spanish, and the uninterpretable D-feature in AGR-O in French and Italian.

Assuming that the D-feature of AGR-O in Greek and Spanish is [+interpretable] we take its interpretation to be strictly analogous to the D-feature of AGR-S as the subject in null-subject languages (Wexler 1998). If the D-feature of AGR-O is [+interpretable], the interpretation is that of the object itself.

This interpretation of the D-feature of AGR-O as the object will be mediated by long-distance agreement of AGR-O with the object. If there is a visible object (clitic-doubling) the visible object will be in a long-distance AGR relation with AGR-O. If there is no other surface object then the object will be an empty one, say *pro* in object position. This is quite analogous to the interpretation of the AGR-S as the subject in null-subject languages, in a long-distance AGR relation with either a visible or empty (*pro*) subject.

The theorem derived from these assumptions can be formulated as follows:

(11) *A language is a clitic-doubling language only if it does not have agreement with the participle, assuming the appropriate morphology exists.*

(11) is quite likely right, to a first approximation. Clitic doubling languages seem to have no participial agreement with the clitic. For Greek, for example, Iatridou (1995) shows that what looks like it might be participial agreement is really another construction.

The parameter of of [+/-] interpretable feature for AGR-S is independent of the parameter of [+/-] interpretable feature for AGR-O. We can moreover predict word order differences among languages depending on these two parameters. In Italian the object moves to Spec, AGR-O, since the D-feature of AGR-O is [-interpretable]. Since AGR-S has a [+interpretable] D-feature, the subject does not raise to AGR-S. Thus, taking account of the fact that V raises to AGR-S, the expected word (neutral) is VOS, as is normally argued for in the syntax of Italian. (See Alexiadou and Anagnostopoulou 1998, for further discussion). In French the D-feature of AGR-O is also [-interpretable], but the D-feature of AGR-S is [-interpretable], unlike Italian, so the subject moves to AGR-S on the surface and we obtains the neutral word order of SVO.

In Spanish and Greek the D-feature of AGR-S is [+interpretable] and the D-feature of AGRO is [+interpretable]. The object does not move to AGR-O and the subject does not move to AGR-S. Since V raises to AGR-S, we obtain VSO as the neutral word order. So Greek a null-subject language, which means that it has a [+interpretable] D-feature for AGR-S and without participial agreement, which

means that has a [+interpretable] D-feature for AGR-O is predicted to have neutral word order of VSO, which is correct. The same VSO neutral word order prediction is made for Spanish.

4. Cross-linguistic variation with respect to clitic omission:

4.1 The case of early French clitics

Friedemann (1993/94) reports on Gregoire and Philippe from the CHILDES Corpus. From the ages of 1;11 through 2;3, Gregoire has 1 clitic out of 92 complements, for a clitic use of about 1%. Philippe, in the three files he has 42 clitics out of 625 complements, for a clitic use of 6.7%. The clitic use rate jumps in the next files. From 2;6 through 3;3 there are 99 clitics out of 150 complements, for a clitic use rate of 66%.

Turning to another case, Hamman, Rizzi and Frauenfelder (1994) study the development of the monolingual French of Augustine from ages 2;02 to 2;10. They write that "object clitics are nearly absent in the period 2-2;6 and show an increase only on the last two recordings (2;9). Aside from tracking the raw frequency of clitics, they calculate the number of object clitics out of the total number of utterances with a verb. For the ages 2;0 through 2;6;16 there are 3 object clitics out of 441 utterances with a verb (a rate less than 1%). At the age of 2;9 there are 9 object clitics out of 175 utterances with a verb (a rate of 14,2%). At the age of 2;9;30 there are already 22 object clitics in 155 utterances with a verb.

Jakubowicz, Müller, Kang, Riemer and Rigaut (1996) and Jakubowicz, Müller, Riemer and Rigaut (1997) study the productions of young French children in the age range 2;5 to 2;7. As discussed by Hamman (1997), the former authors divided children into two groups. The less mature group uses clitics only 9% of objects whereas the more mature group uses clitics in 30% of objects. This clearly suggests that there is omission of clitics and supports (1b).

4.2 The case of early Italian clitics

Turning to Italian, Schaeffer (1997) did an elicitation experiment on pronominal clitics in Italian. She set the children up in situations in which a clitic object should be expected. She tested children from 2 to 5;11 as well as adult controls. The discourse situations worked very well in eliciting clitics. Adults gave 100% object clitics and 0% full direct objects. The 2;1 to 2;6 (mean age 2;5) year old children produced 14% direct objects and only 22% clitics (the rest is raw omission). The 3;1 to 3;11 (mean 3;5) year old children produced 23% full direct object and 62% overt clitics. Clearly, the young OI-age children produce too many full direct objects.

5. The Greek Data

5.1 Naturalistic data

The data presented in this Section are naturalistic and come from two sources: the CHILDES database for Greek (Stefany Corpus, 1995) and the Doukas Corpus. The CHILDES data consist of four children, aged from 1;9 to 2;9.

In the table (1) (from Stefany Corpus) below, we have calculated the percentage of clitic omission (out of all transitive verbs) separately from the omission of full DPs/CPs (out of all transitive verbs) based on the context (as much as this was possible). However for methodological reasons we have to compare the total omission rate to the studies in other languages, since the way that it has been calculated in the literature typically does not distinguish omission of clitics from omission of full DP objects. Thus in the same table we present the number of clitics used at each stage which allows us to compare to other languages.

	Age	Trans Verbs	Clitics used	DP/CPs used	Rate of omitted DP/CPs	Rate of omitted clitics	Total omissi on rate
Kid 1	1;9	77	10	35	12,9%	19,5%	32,4%
Kid 2	1;11	46	10	23	6,5%	15,2%	21,7%
	2;5	86	50	41	2,3%	1,1%	3,4%
Kid 3	1;9	302	49	82	3,6%	5,6%	9,2%
	2;3	187	54	78	1,6%	4,8%	6,4%
Kid 4	2;3	68	25	29	7,3%	5,9%	13,2%
	2;9	145	81	44	0,6%	0,6%	1,3%

Table 1

	AGE	Transitive Verbs	Clitics used	DP/CPs used	Rate of omitted DPs/CPs	Rate of omitted clitics	Total omissio n rate
M A R I A	2;0.24	24	6	15	8,3%	4,1%	12,5%
	2;2.8	77	39	35	1,2%	2,5%	3,8%
	2;3.18	54	46	27	0%	3,7%	3,7%
	2;5.4	99	46	50	4%	2%	6%
	2;5.24	71	36	37	4,2%	0%	4,2%
	2;7.1	61	37	24	0%	0%	0%
	2;8.27	85	35	57	0%	0%	0%

Table 2

We can claim that there is no real clitic/object omission in early Modern Greek already from the age of 2. Comparing the number of clitic used in French, as presented in Section 4.1 to the clitics used in early Greek, as in Table (1) and (2), we can see that there is a significant Clitic Omission stage extending past age 2 for French and Italian, but no such stage for Greek. This is a significant difference predicted by the UCC theory. On the other hand, differences in how the naturalistic data are studied make an elicitation experiment an even stronger and clearer test of the theory. Wexler, Gavarro and Torrens (2003) replicated Schaeffer's (1997) Italian experiment on Spanish and Catalan. They showed that there is almost no clitic omission in Spanish even in the 2-year age range, whereas there is very much omission in Catalan. Spanish does not have participial agreement and Catalan does.

Thus these results strikingly confirm the UCC analysis. In the next section we report an elicitation study of Greek clitics in the same spirit – to repeat the method of Schaeffer closely, where we have a prediction of very different results for Greek than for Italian.

5.2 Elicitation study

In order to test whether children would omit the clitic in an obligatory context (D-linked definite objects should appear in a clitic-shape), we performed an elicitation task with 25 monolingual Greek children (control group 100% performance), replicating Schaeffer's (1997) method closely. According to their age we divided them into two separate groups[5]. The first group consists of 15 children from age 2;4 to 3 and the second group consists of 10 children from age 3 to 3;6. All children speak the standard Greek dialect.

In the elicitation task five different pictures were used followed by questions for controlled answers, that is, the questions were devised to eliminate the possibility of using a DP instead of the clitic (as in Schaeffer 1997). To illustrate it with an example, a picture would be shown where a little boy is kissing a little girl:

Experimenter's Question: Ti kani edho to agoraki sto koritsaki?
"What is the boy doing here to the little girl? "

Expected Answer: To filai. "He is kissing her"

All the expected answers require a clitic (with a transitive verb) in Modern Greek. From all the 125 environments (5 pictures multiplied with 25 children) for clitics only one child (aged 2;6) omitted a clitic once (that was also the overall object omission). This means that the percentage of clitic omission of clitic omission in Greek is 0,8%. It is fair to say that there is no clitic omission in early Modern Greek. Note that the percentage of clitic omission in Greek is comparable to object pronoun omission in English, actually even less (Hyams and Wexler 1993).

Again the comparison with elicitation tasks in other languages (i.e. Schaeffer, Jakubowicz) show that there is a massive difference in clitic omission between Greek and French/Italian. Schaeffer's two year-old Italian children omitted object clitics 62% of the time; in the same experiment done on Greek 2 year-old children, we found that they omitted object clitics less than 1% of the time! Even Schaeffer's 3 year-olds omitted the object clitics 15% of the time (0% for our Greek 3 year-olds). Moreover, Schaeffer's Italian 2 year-olds gave a full DO answer 23% of the time and the 3 year-olds gave a full DP answer 23% of the time. The full DP is strongly infelicitous in the context, but the children give these because of the trouble with clitics (UCC). Our Greek children gave *no* full DP (without clitic) responses[6].

[5] Initially we had these two age-groups for the reason that 3 is roughly the end of the Optional Infinitive stage, and we wanted to observe any differences during and after that; however it turns out that for Greek it does not make any difference whether we had one or two groups.

[6] In some cases, children would use the clitic doubled with a full DP in their answers. This is in general accepted in Modern Greek since Clitic Doubling is usually optional.

They simply have no trouble at all using clitics, even the 2 year-olds. Clearly, the predictions of the UCC (the generalization that a language omits clitics in development if and only if the language shows participial agreement (given that the morphology exists)), has been strongly confirmed by the clearest possible method. The same experiment, done cross-linguistically (Italian (Schaeffer), Spanish and Catalan (Wexler, Gavarro and Torrens) and Greek (us) gives stunningly different results in the different languages, as predicted by a precise theory. It is hard to imagine stronger confirmation of a theory, or of the method that says that linguistic theory provides an important route to insight into language acquisition.

6. Conclusions-further discussion

In this paper, we have shown that there is no significant clitic omission in Early Greek language. The percentage of clitic omission is comparable to omission of full pronouns in early English (Hyams and Wexler 1993). The cross-linguistic differences with respect to clitic omission are related to whether there is participial agreement in a language or not and the Unique Checking Constraint accounts for the differences expected among languages. This follows if Greek has [+interpretable] D-feature for Agr-O, while in French and Italian the D-feature in AGR-O is [-interpretable] and therefore it has to move to check its feature first with AGR-O.

From the group of languages under investigation both languages with clitic omission (French, Italian) are non clitic doubling languages while both languages with no clitic omission (Greek, Spanish) are clitic doubling languages. Catalan also fits the description, even though the analysis is complicated by the fact that participial agreement in Catalan is optional. Subject to further investigation, it would be interesting to see whether the generalisation is true for more languages and how exactly clitic doubling correlates indirectly to either participial agreement or directly to clitic omission.

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Discourse Binding: Does it Begin with Nominal Ellipsis?

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1. Introduction

Sentences are normally not used in isolation. They are preceded and followed by other sentences, delivered either by the same speaker or writer, or by an interlocutor. Language users live by the principle that sentences in sequences belong together; that they are meaningfully connected. Language users weld sentences together into a coherent representation of discourse. Coherence is a cognitive state; it is not 'in' the language, although sentences may contain devices that help the perceiver in creating it. Sanders, Spooren and Noordman (1992) distinguish between *relational* coherence, denoting the semantic or logical relations between discourse segments, and *referential* coherence, having to do with repeated reference to the same entities or events. Relational coherence can be cued by connectives; anaphora is the primary device for referential coherence. Inferencing is a third major mechanism in creating coherence.

Research on the development of discourse integration has been relatively sparse. Relational coherence, in particular, seems to be underexposed (see Evers-Vermeul, 2000). Work on referential coherence, notably the use of pronominal anaphora, has a longer history; a classic example is Karmiloff-Smith (1980). In this paper we focus on another type of anaphora, viz. nominal ellipsis. We want to determine whether children understand ellipsis, particularly, whether they know that a proper understanding of ellipsis depends on discourse linking.

Discourse integration has been argued to be a late achievement in language acquisition. Karmiloff-Smith (1980) found that children under age 6 largely rely on deictic resolution of definite noun phrases and pronouns in a story context, rather than anaphoric interpretation. Avrutin and Coopmans (2000) studied 4-year-olds' ability to make bridging inferences (Clark & Haviland, 1977), specifically in contexts where a definite DP can refer back to a DP containing a different noun, in a preceding sentence. They found that children often fail to do this, which they ascribe to a lack of computational resources to complete necessary operations at the level of the discourse model (but see Van der Weert, 2002).

Krämer (2000) studied Dutch-speaking children's interpretation of indefinite object DPs in base (low) and scrambled (high) positions. Her data show that most children interpret low object DPs in an adult-like manner, but that they treat scrambled indefinite objects in the same way as non-scrambled ones. Krämer claims that it takes until age 7 or 8 until children begin to perform adult-like with regard to scrambled indefinites. She argues that a high indefinite DP needs to be linked to an element in the preceding discourse context (this is not so for low indefinites). Linking depends on the ability to make bridging inferences. To account for young children's failure to correctly link high indefinite DPs, she assumes that they are not yet capable of discourse integration through bridging.

These results suggest that young children generally have a poor understanding of discourse (including dialogue); they cannot integrate. This strikes us as implausible – it seems strange to deny that a child can integrate the semantics of discourse as soon as a story holds a child's attention. Two other versions of the 'no integration' hypothesis could be developed. First, one could plausibly argue that sentence by sentence the child creates a semantic or conceptual representation, but forgets the syntax. Consequently, the child would be able to connect meanings, but linking on the basis of grammatical devices, such as pronouns or determiners, would be impossible. Alternatively, one could argue that visual context provides support that makes grammatical connections unnecessary (Avrutin & Coopmans, 2000). When presented with a sequence like (1), a child who is incapable of storing the syntactic form of the first sentence cannot connect 'he' to 'John'. But if there is a picture available, 'he' could be connected directly to the picture and no discourse information would be necessary, making it seem that the child has integrated the discourse when in fact it has not occurred.

(1) John has a new coat. He put the coat on.

The present study was set up to demonstrate that, counter to claims made in the literature, young children can link sentences into a discourse, and that they make use of syntactic devices to do so. We focus on nominal ellipsis, a type of discourse anaphora that depends crucially on syntactic representation and integration. On the assumption that the principles determining syntactic structure building are available as early as age 2, we predict that young children can interpret this type of ellipsis through syntactic integration, i.e., the identification of syntactically structured information in the immediately preceding discourse. It follows that failures of discourse integration must be traceable not to an absence of the syntactic integration mechanism, but to the child choosing an incorrect grammatical representation where Universal Grammar allows variation (Abdulkarim & Roeper, 1997; Guo, Foley, Chien, Chiang, & Lust, 1997; Matsuo & Duffield, 2001; Thornton & Wexler, 1999).

Ellipsis is ubiquitous in natural language. Hardly a single dialogue fails to use it, and it is a frequent phenomenon in child-directed speech, as a perusal of the CHILDES database demonstrates. Children must cope with it, and, according to our impression, usually do so without many problems, cf. the dialogue excerpt from the Sarah corpus (Brown, 1973; MacWhinney, 2000) in (2).

(2)
```
*CHI:  I drink it all up .
*CHI:  give me some more .
*CHI:  a lot .
*MOT:  I don't see any more .
*CHI:  yes you do .
*MOT:  want a little milk ?
*MOT:  want some ?
*CHI:  (a)n(d) shake it all up .
*CHI:  a bigger one ?
*MOT:  mmhm .
```

Note that the expressions 'some', 'any', 'all', 'a lot', 'one', 'more', 'you do', and even 'mmhm' all call for reconstruction and it does not seem to be a problem for either the child or the adult. It is possible, however, that in this and similar dialogues, the non-linguistic context helps the child to connect the sentences into a coherent representation, as pointed out above. Clearly, showing that children can do discourse integration on the basis of linguistic information calls for a properly controlled experiment.

Our study uses a paradigm pioneered by Lyn Frazier and her colleagues (Frazier et al., 2003). Adapting a setup used by Wijnen and Kaan (2003) in an online experiment with adults, we had our the target sentences contain a nominal ellipsis marked by a bare cardinal, as in example (3).

(3) Five ships appeared on the horizon. Three sank.

Frazier et al. and Wijnen and Kaan have shown that adult perceivers prefer a 'presuppositional' or 'forward-directional' (Hendriks & de Hoop, 2001) reading of the bare cardinal. This means that they take the elided nominal element to refer to the set defined in the introductory sentence (i.e., three of the five ships that appeared on the horizon). If the second sentence is manipulated in a way that blocks the preferred meaning (for instance by changing the cardinal into one that exceeds the size of the context set), processing difficulty arises.

In the present study, short discourses analogous to the one in (3) were presented together with a picture. The critical sentence was turned into a question, which the participant was encouraged to answer (see ex. 4). Crucially, the combination of picture and story was set up in a manner as to be able to differentiate between responses based on visual support and those based on discourse integration.

(4) Here's a playground.
It's great to do all kinds of funny things when you're out in the playground, like swinging, making a sand castle or climbing on the monkey bars.
There are some kids playing in the sand box.
Are two upside down?

In one condition – the control condition – the discourse in (4) was combined with a picture of a playground containing the usual paraphernalia, including a sandbox. Crucially, the picture displayed two children in the sandbox who are standing on their heads. In another condition, we presented the same discourse with a picture identical to the first in all relevant respects, except that the two children who are upside down are *outside of the sandbox*. The third condition also involved exactly the same discourse, but this time combined with a picture in which two *adult* figures outside of the sandbox are upside down. Note that in each condition the picture displays two figures that are upside down. This implies that if the child interprets the bare cardinal deictically, taking it to mean something like 'two anything', she will give a positive response in all three conditions. However, if the child knows that the bare cardinal marks an elided nominal element that needs to be reconstructed on the basis of the previous discourse, she is predicted to say 'yes' in the first (control) condition only, and 'no' in the other two.

The difference between the latter two conditions (children upside down outside the sandbox vs. adults upside down) allows us to explore the degree to which reconstruction is affected by the syntactic status of the antecedent. In the second condition described above, a correct 'no' answer can only be supplied if the child reconstructs both 'kids' and 'in the sandbox'. We call the phrase 'kids' the *argument* because the sentence is uninterpretable without some noun, and 'in the sandbox' an *adjunct* because it is syntactically and semantically optional. In the third condition, reconstruction of the argument only (kids) suffices to give a 'no' answer.

2. Experiment I: English

2.1 Method

Participants. The experiment involved 28 children recruited from two daycare centers in Amherst, Massachusetts, USA. Mean age of the children was 53.6 months (= 4;6 approximately; range: 40-69 months)

Materials. We used 15 stories analogous to the one in example (4), each combined with one of three different pictures, to create the three experimental conditions as explained above, which we label 'control' (C), 'argument & adjunct reconstruction' (A) and 'argument only reconstruction' (E), respectively. The experimental items were distributed across three lists so that each list contained only one version of each item. The experimental items were interspersed with 10 filler items, a number of which were explicitly designed to elicit 'no' answers.

Procedure. We used a variant of the truth value judgment task (Crain & Thornton, 1998). Children were presented picture-story combinations in a setting that had nearly all of the characteristics of normal picture book reading. Children were encouraged to answer the critical question (and other questions) in any way they saw fit. All participants were tested individually by one experimenter in a quiet area in the day care center. A second experimenter was present to make notes and manipulate a video camera, which was positioned unobtrusively in a corner. Just before the actual experiment, the experimenter would informally explore whether the child understood the cardinals (two, three and four) used in the experimental items. It turned out that all children did.

2.2 Results and discussion

The overviews of the results and the analyses refer to averaged percentages of 'yes' conditions per experimental condition. Four children exclusively supplied 'yes' responses, irrespective of condition. We felt that these children did not understand what was asked of them, and therefore excluded their data from the analyses.

A: Arg + Adj reconstr	*C: Control*	*E: Arg reconstr*
35.6%	84.4%	26.7%

Table 1: Average percentages of 'yes' responses across conditions.

Table 1 displays the average percentages of 'yes' responses as a function of condition. A one-way repeated measures ANOVA yields a significant effect (F(2,16)

= 37.21, $p < .001$), indicating that the proportion of yes-responses is reliably lower in conditions A (argument + adjunct reconstruction) and E (argument only reconstruction) than in the control condition C. Recall that, given the visual information in the picture, a deictic strategy would yield a majority of 'yes' responses in each of the conditions. Strikingly, the pattern of responses comes close to what we expect for adults. This suggests that the children (average age 4;6) know that the nominal ellipsis must find an antecedent in the preceding discourse, and are furthermore able to reconstruct that antecedent.

The percentage of 'yes' responses is somewhat lower in the argument reconstruction condition than in condition A (argument + adjunct reconstruction). This might suggest that performance is better (i.e., more adult-like) in condition E than in condition A. However, an ANOVA indicates that the difference is not reliable ($F(1,17) = 2.47$, $p = .134$). Nonetheless, we see something of a trend here, which is underscored by a look at individual children's response patterns. In fourteen of the participants a difference in average score between conditions A and E was observed, and in 10 of these cases, performance on condition E was more adult-like (lower percentage of 'yes') than on condition A.

	A: Arg + adj rec	*C: control*	*E: Arg reconstr*
42-56 months (n=8)	40%	84%	36%
57-67 months (n=10)	30%	85%	15%

Table 2: Average percentage of 'yes' responses broken down over condition and age group.

In order to see whether there is a developmental trend, we divided the subjects in a younger group (42-56 months) and an older group (57-67 months). Table 2 shows the corresponding breakdown of the data. A two-way repeated measures ANOVA yielded a significant main effect of condition, parallel to the one found in the undivided data ($F(2,15) = 41.77$, $p < .001$). The effect of age group, however, was not significant ($F(1,16) = 2.29$, $p = .15$), nor was the interaction ($F < 1$). Still, a visual inspection of the results in Table 2 suggest a trend: The percentage of 'yes' responses in conditions A and E is higher in the younger group than in the older group, and the difference appears to be largest in condition E. The latter observation is suggestive of a difference in degree of difficulty between the conditions A and E (in line with the individual data presented above), but obviously, we cannot draw firm conclusions in the absence of statistical support. Possibly, the absence of a significant effect is due to a lack of power.

Summarizing, the results of this study – i.e., the significant difference in percentages of 'yes' responses between on the one hand the control condition (C), and, on the other, the two experimental conditions (A, E) – indicate that four-year-old children (1) recognize nominal ellipsis (as marked by a bare cardinal); (2) know that such ellipsis requires a *discourse* antecedent (not just any referent); and (3) are capable of reconstructing this antecedent. This finding clearly opposes the suggestion that children below age 6 are incapable of discourse integration.

3. Experiment II: Dutch

In view of our contention that language-specific properties of grammar modulate young children's ability to deal with ellipsis, we were interested in setting up a Dutch replication study. With respect to the constructions used, Dutch differs from English in requiring *there*-insertion, without which bare cardinals are unacceptable or marginal, cf. example (5), a Dutch version of (4) above.

(5) Hier is een speeltuin.
Je kunt veel leuke dingen doen in de speeltuin, zoals schommelen, een zandkasteel bouwen of op het klimrek klimmen.
Er spelen een paar kinderen in de zandbak.
☺*Staan er twee op hun kop?* ☹*Staan twee op hun kop?*

What might be the effect of this notorious Dutch 'er' (there)? Let us take a cue from a proposal made by Hale and Keyser (2000). Based on an analysis of Navajo, they suggest that 'there' binds a locative in the VP:

(6) There are three kids in the sandbox.
there-x are three girls (in the sandbox)-x

This variable binding indicates that the locative can be regarded as an obligatory argument of 'there', therefore not an adjunct. Although we are unaware of a formal treatment of this process, it is intuitively clear that a Presentational form introduces new information and therefore blocks reconstruction, except where interpretation cannot succeed without it. In effect, there-insertion seeks *parallelism* at the level of Presentational Variables, and the locatives are construed as *contrastive*, rather than additive:

(7) Presentation 1: three girls are in the sandbox
Presentation 2: there are two upside down
→ there are three girls in the sandbox
there are two { } upside down
{girls}
{girls in the sandbox}

Presentation 2 is *independent* of Presentation 1 and therefore only obligatory missing information is added in order to reach (converge on) an interpretation. If 'in the sandbox' is an argument of 'are' and 'upside down' is an argument of 'there', they are parallel The process creates a *contrastive parallelism* where the locative 'in the sandbox' stands in contrast to 'upside down'. Therefore only the N (girls) must be reconstructed. By contrast, where no Presentational 'there' is present, the nominal operates essentially anaphorically, and therefore all information is reconstructed. The expression 'girls in the sandbox' is reconstructed and 'upside down' becomes an additional modifier. That is, 'two' would be like 'they' in:

(8) Three girls are in the sandbox. They are upside down.

On the basis of this reasoning, we predict that Dutch bare cardinals *with* 'er' allow a less stringent interpretation – argument reconstruction only – than English bare cardinals *without* 'there'. This predicts that Dutch children (and adults, for that matter) will find a positive reply (yes) to the question 'Are there two upside-down?' in the context of the discourse in (5), combined with a picture in which two kids *outside the sandbox* are upside down more acceptable than English-speaking children (and adults).

On the other hand, Dutch 'er' is notoriously multifunctional, and acceptability judgments on its presence or absence in relevant contexts vary widely over dialects and individual speakers (Grondelaers & Brysbaert, 1996). In an attempt to get a firmer grip on the effect of 'er'/'there', our second experiment included a additional set of materials, in which nominal ellipsis did not need 'er' support. This is possible when if the elided nominal element is indicated by an inflected adjective, as exemplified in (9).

(9)	Hier is Nijntje.	"here is Nijntje"
	Er staan allemaal dieren bij haar.	"there are all kinds of animals with her"
	Kijk, er zijn hondjes	"look, there are doggies"
	Heeft de bruine een bot?	"does the brown (one) have a bone?"

If our assumption about the function of 'there'/'er' is on the right track, the prediction should be that discourses like (9) combined with a picture that conforms to a *parallel* interpretation of the ellipsis (e.g. one in which a brown cat has a bone) will yield fewer positive responses than those with critical sentences that contain 'er'.

Our experiment now entails reference to grammar particular representations in reconstruction. Since these distinctions must be acquired, both the English and the Dutch child may not begin with the right assumption. Is the default assumption that children begin with full reconstruction – treating the numeral as an anaphor – or with the contrastive parallelism that *there* invites? We will argue that where deviation occurs, the child chooses less reconstruction, although the principle of reconstruction seems always available.

3.1 Method

Participants. 47 children (27 boys), recruited at day care centers in Utrecht (The Netherlands) and surrounding towns took part in the experiment. Their mean age was 41.5 months (range 28-57), i.e., 3;6 approximately.

Materials. We used two sets of materials. The first consisted of Dutch adaptations/ translations of the English used in Experiment I. All of these contained the adverbial 'er' (there). A new set of items was added in which the nominal ellipsis was marked by a bare (inflected) adjective such as 'de bruine' (the brown (one)). In such constructions, the grammar of Dutch does not allow 'er'. For these new items, pictures were made which instantiated the A, C and E conditions, analogously to what happened in the original items with bare cardinals. For instance, for the discourse given in (8) above, the A condition involved a picture in which a *white*

dog had a bone, and condition E was constructed by presenting a picture in which a brown *cat* had a bone. Note that there is a difference between these operationalizations and those in the original set of materials, in that the picture in the A condition in itself supplies sufficient information to give an adult-like 'no' answer (since there is no brown entity with a bone in the picture).

The old and new items were intermixed and distributed over three lists according to the counterbalancing procedure described for Experiment I. They were interspersed with 9 filler items adapted from the English originals.

Procedure. The experimental procedure was identical to what was done in the English experiment, except that no second experimenter was present.

3.2 Results and discussion

Eight of the children (4m, 4f) virtually only responded with 'yes' to virtually all questions, irrespective of condition. This was judged to be the result of a failure to understand the task, and therefore their data were not included in the analysis.

Table 3 gives the average percentages of 'yes' responses, broken down over condition and item set. Just as in Experiment I, the effect of condition is significant in a one-way repeated measures ANOVA ($F(2,33) = 65.63$, $p < .001$), suggesting, that these Dutch children, just like their English-speaking peers, recognize ellipsis and know that it should be interpreted through the reconstruction of elements in the preceding discourse. The effect of item set was marginally significant ($F(1,34) = 4.02$, $p = .053$), supporting the impression that the percentage of 'yes' responses was slightly lower in the new (no 'er') items (51%) than in the old ones (59%), overall. This result is in line with our suggestion that 'er' facilitates a parallel interpretation of the elided element. It should be noted, though, that the effect occurs irrespective of condition, whereas we expected it to surface in A and E conditions. There was no reliable interaction between condition and item set ($F < 1$), however.

	A: Arg+adj reconstr	*C: Control*	*E: Arg reconstr*
old items (er)	45.3%	93%	38.7%
new items (¬ er)	31%	88.1%	33.8%
all items	38.1%	90.6%	36.3%

Table 3: Average percentages of 'yes' responses broken down over condition and item set.

The results of Experiment I suggested that argument-only reconstruction is less difficult than argument-plus-adjunct reconstruction – we observed slightly more non-adult-like 'yes' responses in condition A than in condition E. The same trend is observed in the present data set, but only for the 'er' items. Recall, however, that condition A differs on a crucial point between 'er' and non-'er' items. In the new items, the visual information in condition A is by itself sufficient to base a 'no' answer on, whereas in the old items, inspection of the picture alone (ignoring the preceding discourse) would suggest a 'yes'. In that sense, the new condition A was easier than the old one. Obviously, the putative effect of the presence or absence of 'er' is confounded by this difference.

younger children	*A: Arg+Adj reconst*	*C: Control*	*E: Arg reconstr*
old items (er)	47.2%	93.6%	42.6%
new items (¬ er)	38.5%	84.6%	52.6%

older children	*A: Arg+Adj reconst*	*C: Control*	*E: Arg reconstr*
old items (er)	44.2%	92.7%	36.4%
new items (¬ er)	26.5%	90.2%	22.7%

Table 4: Average percentages of 'yes' responses, broken down over condition, item set and age group. Younger children: 32-38 months (mean 35.9, n = ??); older children: 39-57 months (mean 45.7, n = ??).

To explore whether a developmental trend is present, we divided the subjects over two age groups, and ran a three-way (condition * item set * age group) repeated measures ANOVA. A summary of the results is given in Table 4. The main effect of age group was not significant ($F(1,33) = 2.79$, $p = .104$), nor did age group interact significantly with any of the other factors. Nonetheless, a visual inspection of Table 4 leaves the impression that the percentage of 'yes' responses in the critical conditions A and E decreases with increasing age, particularly in the new items.

4. Cross-linguistic comparison

In order to evaluate whether language makes a difference, we entered the data of the Dutch and American children in one two-way (condition * language) ANOVA. For the Dutch children, we only included responses to the items that have counterparts in the original English set – i.e., the bare cardinal items. Thus, we compare Dutch items with 'er' with English ones without 'there'. The percentages of 'yes' responses are given in Table 5. The overall main effect of condition turned out to be significant ($F(2,53) = 61.49$, $p < .001$), which basically repeats what we have seen before. The main effect of language is significant as well ($F(1, 54) = 4.54$, $p < .05$), reflecting the overall higher amount of 'yes' responses in the Dutch version of the experiment. The interaction was not significant ($F < 1$).

Note that the higher proportion of 'yes' responses in the Dutch version of the experiment is an overall effect, present even in the control condition, which would seem to be at odds with a direct effect of language. For some reason, the Dutch children simply seem more inclined to say 'yes' than the American children, and this may well have to do with the age difference; the US children are on average nearly one year older than the Dutch children.

	A: Arg+Adj rec	*C: control*	*E: Arg reconstr*
Dutch	45.3%	93.0%	38.7%
English	35.6%	84.4%	26.7%

Table 5: Average percentages of 'yes' responses broken down over condition and language.

The younger group of American children roughly falls within the same age range as the older Dutch children (42-56 months and 39-57 months, respectively).

To test whether age is the factor that produced the overall difference between American and Dutch children summarized in Table 5, we ran a new ANOVA, after excluding the older American and younger Dutch children. The results are given in Table 6. As before, the main effect of condition is significant ($F(2,30) = 29.02$, $p < .001$), but the main effect of language, witnessed in the previous cross-linguistic analysis, has disappeared ($F < 1$). Neither is there an interaction of condition and language.

	A: Arg+Adj rec	*C: control*	*E: Arg reconstr*
Dutch: 39-57 mo	44.2%	92.7%	36.4%
US: 42-56 mo	40%	84%	36%

Table 6: Average percentages of 'yes' responses broken down over condition and language, comparing younger American and older Dutch children.

5. General discussion

The evidence collected in our experiments clearly shows that young children – as young as 3 years of age – know how to interpret nominal ellipsis. Given that ellipsis is ubiquitous in natural dialogue and that children generally do not seem to be puzzled by it, this may be unsurprising, but in fact it is an amazing achievement. Presented with a picture of a playground and a discourse like *'Some kids are playing in the sandbox. Are two upside down?'*, the child realizes that 'two' cannot refer to any two entities that happen to be upside down in the picture. Rather, she knows that the bare cardinal is an anaphor, and that a certain cardinality (two-ness) is predicated over an unexpressed element, which is to be reconstructed from what the adult experimenter has *said,* not from what she *shows*. In other words, the child demonstrates an ability to integrate discourse. We believe that children are capable of this remarkable feat because their syntactic competence helps them. Our claim is that children know that elements like bare cardinals mark incompletely specified syntactic structure, which needs to be filled in with material from the immediately preceding discourse; in other words, they possess a mechanism for syntactic integration.

Our experiments contained a condition in which reconstructing an argument only was sufficient to see that the experimenter's question should be answered in the negative, and one in which both the argument and an adjunct were crucial. Assuming that the child's answer is based on syntactic reconstruction, as we do, it would seem likely that the latter case (condition A) is more difficult – and yields more errors – than the former. It turns out that, although we think we see the beginnings of a trend in this direction, we cannot decide in favor of this prediction. Further, more careful experimentation is needed.

We expected an effect of variation in grammar on reconstruction in ellipsis. Specifically, we speculated that there-insertion would promote parallel interpretation of the ellipsis, rather than a presuppositional interpretation (which means that with 'there' present, perceivers would tend to give an affirmative response to the question in (4) when the picture shows two children upside down outside of the sandbox). The slight difference between the English (without 'there') and Dutch ('er' present) results suggests that children are sensitive to the properties 'there'. It should be kept

in mind, though, that neutralizing the age effect quite effectively suppressed the difference between Dutch and American children.

In the Dutch items without 'er', parallel interpretation was possible in condition E (where e.g. a brown *cat* is shown to have a bone). The number of 'yes' responses in this condition is lower than that in the old items (with 'er') in condition A. Although this observation is suggestive, we are reluctant to put very much weight on it, largely because the tendencies cannot be backed up statistically, but also because the old and new items differ in too many respects to make a direct comparison possible. At this point, we can only conclude that the results seem to hold some promise, warranting new and more carefully controlled experiments.

Such experiments should be guided by the following considerations. The child must acquire the distinction between the various functions of 'there': the locative, the presentational and the existential. In Dutch, the presentational-existential distinction is not marked, so 'er' remains ambiguous. In English, very subtle evidence comes into play, as the contrast in (10) reveals.

(10)a. presentational: There's no unicorns. (not here/now)
(as in: no unicorns in this painting)
b. existential: There are no unicorns. (don't exist)

Our prediction, given that the principle of syntactic discourse integration is present from the outset, is that children will immediately integrate new syntactic knowledge into the application of discourse integration. Therefore, when the child acquires the distinction between presentational and existential, it would appear instantly under the parallelism requirement. The general research program which emerges is to explore the claim that every new syntactic distinction will be immediately available to discourse reconstruction.

In conclusion, our study demonstrates that young children are capable of discourse integration, in contradiction to claims made earlier. The contrast between the findings reported here and previous results may be related to a difference in linguistic device. We studied underspecified, non-overt anaphoric devices, rather than pronouns or determiners which figure in the literature cited. On the other hand, even in dealing with pronouns, children may be more advanced than has been generally thought. Moore, Roeper, Asplin and Wagner (work in progress) presented children with simple visual scenes in which for instance Bert plays basketball and Ernie baseball. They provide the following text: '*Bert is playing basketball. Is he playing baseball?*'. If the child were simply using visual context, the answer should be 'yes', since there is a visible 'he' playing baseball. But in fact the children say 'no', indicating that they link 'he' to Bert. It would seem that some of the earlier studies have seriously underestimated children's early competence.

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