

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 (Chomsky 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 interpret 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 imperceptibly 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.

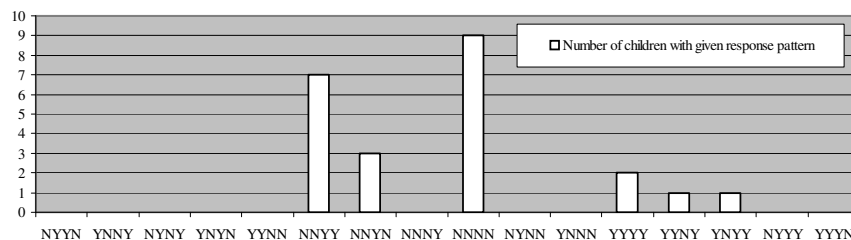


Figure 1: Response patterns (NS₁ NS₂ MS₁ MS₂) N=NO; Y=YES

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 against a syntactic view of focus.

References

- Chomsky, N. (1971) 'Deep Structure, Surface Structure and Semantic Interpretation' in: D. Steinberg and L. Jakobovits (eds.) *Semantics, and Interdisciplinary Reader in Philosophy, Linguistics and Psychology* Cambridge University Press, 183–216.
- Cinque, G. (1993) 'A null theory of phrase and compound stress' *Linguistic Inquiry* 24,239–67.
- Crain, S. and C. McKee. (1985) 'The acquisition of structural restrictions on anaphora' in: S. Berman, J. et al (eds.) *Proceedings of NELS 15*. Amherst, Mass.: GLSA, 94–110.
- Crain, S., W. Ni & L. Conway (1994) 'Learning, parsing and modularity' in: C.Clifton, L. Frazier & K.Rayner (eds.) *Perspectives on sentence processing*. Lawrence Erlb., 443–67.
- É.Kiss, K. (1998) 'Identification focus and information focus' *Language* 74, 245–273.
- Gualmini, A., S. Maciukaite and S. Crain (2002) 'Children's insensitivity with contrastive stress with *only*' *Penn Working Papers in Linguistics* 9(1).
- Halbert, A.M., S. Crain, D. Shankweiler and E. Woodams (1995) 'Interpretive use of emphatic stress by children' Poster presented at CUNY 8, Tucson, AZ.
- Hirsch-Pasek, K., D. Kemler Nelson, P. Jusczyk, K. Wright Cassidy, B. Dross and L.J. Kennedy (1978) 'Clauses as perceptual units for prelingual infants' *Cognition* 26, 269–86.
- Jusczyk, P.W. and E.J. Thompson (1978) 'Perception of a phonetic contrast in multisyllabic utterances by two-month-old infants' *Perception and Psychophysics* 23, 105–109.
- Mehler, J., P. Jusczyk, G. Lambertz, N. Halsted, J. Bertoncini, C. Amiel-Tison (1988) 'A precursor of language acquisition in young infants' *Cognition* 29, 143–178.
- Morgan, J.L. (1986) *From Simple Input to Complex Grammar* Cambridge, MA: MIT Press.
- Neeleman, A. and K. Szendrői (2004) 'Superman sentences'. *Linguistic Inquiry* 35(1), 149–59.
- Reinhart, T. (1995, to appear) *Interface strategies*. OTS Working Papers/ MIT Press.
- Reinhart, T. (1999) 'The processing cost of reference-set computation: guess patterns in acquisition' *OTS Working Papers in Linguistics*.
- Selkirk, E. (1984) *Phonology and Syntax*. MIT Press.
- Selkirk, E. (1995) 'Sentence prosody: intonation, stress, and phrasing' in: J.A. Goldsmith (ed.) *The Handbook of Phonological Theory*. Cambridge, MA: Blackwell, 550–569.
- Szendrői, K. (2001) 'Focus and the syntax-phonology interface' PhD dissertation, UCL.
- Zubizarreta, M.-L. and J.-R. Vergnaud (2000) 'Phrasal stress, focus and syntax' ms. USC.