

## Exhaustivity Operator(s) and Hungarian Focus Structure

In the current syntactic, semantic and pragmatic literature focus, ‘only’ and exhaustivity are a major subject of study. There are several proposals for the semantics and pragmatics of *focus*, and the focus sensitive particle ‘only’.<sup>1</sup> The most famous analysis of exhaustive interpretation of answers is from Groenendijk and Stokhof (1984), which is widely studied and used in recent work.<sup>2</sup> For many languages – for example Basque, Catalan, Greek, Finnish, Hungarian – focus is a significant syntactic matter as well.<sup>3</sup> The issues of focus, ‘only’ and exhaustivity are often claimed to be interrelated, and from a linguistic perspective the study of Hungarian is a particularly interesting case. Hungarian has a special pre-verbal position for focused constituents, which is assigned a pitch accent and gets an exhaustive interpretation. The main aim of this paper is to investigate Hungarian focus constructions and their interpretation and to point out that in order to give a proper analysis of Hungarian focus constructions we have to bring together the above mentioned issues: the syntactic structure of the sentence, the semantic interpretation, pragmatic effects and the intonation pattern. We hope this brings to bear on the interpretation of focus, ‘only’ and exhaustivity in other languages as well.

**1. The Focus Position in Hungarian** The special structural position for the focused element(s) is the immediate pre-verbal position. In “neutral sentences” the immediate pre-verbal position is occupied by the verbal modifier (VM) whereas in focused sentences this position is occupied by the focused element, and the verbal modifier is behind the finite verb. The constituent in the focus-position is assigned a pitch accent and receives an *exhaustive* interpretation (small capitals indicate pitch accent). Since in Hungarian both ‘only’ and identificational focus indicate exhaustivity, the question arises whether sentences with bare (identificational) focus (1a) and sentences with ‘only’ (1b) get the same interpretation or not and if they are not the same what the difference is.

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| <p>(1) a. ANNA hívta fel Emilt.<br/>Anna called VM Emil.acc<br/>‘It is Anna who called Emil.’</p> | <p>b. Csak ANNA hívta fel Emilt.<br/>only Anna called VM Emil.acc<br/>‘Only Anna called Emil.’</p> |
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In classical semantic analyses ‘only’ is identified with an exhaustivity operator, which suggests that identificational focus and ‘only’ get the same semantic interpretation with one *exh/only* operator. An important question here is if ‘only’ in Hungarian has an exhaustive semantic content or not. If we suppose that ‘only’ gets exhaustive semantics, then examples like (1b) involve two exhaustivity operators. We will see later that for the semantics this solution is not a problem, since exhaustification of an exhaustified term does not have semantic effect. However, ‘only’ in Hungarian cannot go together with the non-exhaustive information focus (É. Kiss 1998), which suggest the opposite view. This fact can be an argument in favour of the view that ‘only’ in Hungarian does not get exhaustive semantic content, or it can be an argument against the existence of information focus.

**2. Exhaustivity and ‘only’ in Hungarian** In this paper I choose for the option to give exhaustive semantics for ‘only’. I will suggest an analysis for Hungarian focus and ‘only’ with two distinct operators,  $\mathcal{EXH}$  and  $\mathcal{ONLY}$ . The two operators both get exhaustive semantic content, but  $\mathcal{ONLY}$  has a pragmatic effect on top of it. We will see later that for some multiple focus constructions this distinction is crucial to get the intended interpretation.

The constituents in the pre-verbal focus position are interpreted as exhaustive identification (É. Kiss 1998, Horváth to appear). Accordingly, the semantic interpretation of identificational focus involves an exhaustivity operator. In the focus-analysis of Horvath (to appear) exhaustivity operator appears in the syntactic structure of the sentence. She assumes a quantificational *exclusive identification* operator in the Spec position of the EIP (exclusive identification phrase) and claims that  $EI^0$  encodes exhaustivity syntactically and the Focus itself not.

For the semantic analysis of the exhaustive content of Hungarian focus I follow Groenendijk and Stokhof’s (1984) theory where they give an elegant analysis of the exhaustification of answers. I would like to extend their analysis to apply it to Hungarian identificational focus.<sup>4</sup> For the semantics of linguistic answers they define an answer formation rule introducing an exhaustivity operator, which gives the minimal elements from a set of sets.

$$(2) \quad \mathcal{EXH} = \lambda P \lambda P' [\mathbb{P}(P) \wedge \neg \exists P' [\mathbb{P}(P') \wedge R \neq S \wedge \forall x [S(x) \rightarrow R(x)]]]$$

$\mathcal{EXH}$  is defined as a semantic operation which takes a term  $T$  (GQ) and filters the set  $D$  of sets  $D'$  in the denotation of  $T$  where the set containing  $T$  is included and there is no other set in  $D$  which is the subset of  $D'$ . In this model,  $\mathcal{EXH}$  equals the interpretation of ‘only’, thus, if we give the answer ‘*Anna<sub>F</sub> called Emil.*’ to the question ‘*Who called Emil?*’, then it is interpreted as ‘*Only Anna called Emil.*’. Along this line both the interpretation of (1a) and (1b) involves one *exhaustivity* operator:  $(\mathcal{EXH}(Anna))(called-Emil)$ .

<sup>1</sup> See, e.g., von Stechow (1990), Krifka (1991), Rooth (1985).

<sup>2</sup> E.g. van Rooij and Schulz (to appear) on exhaustivity, Kratzer (2005) on questions.

<sup>3</sup> See Bródy (1990), É. Kiss (1998), Horváth (to appear), Szabolcsi (1981), Szendrői (2003) etc.

<sup>4</sup> Since my aim in this paper is not the comparison of several focus/exhaustivity theories, I will not discuss here the Alternative Semantics (Rooth, 1985) or the Structured Meaning Account (Krifka, 1991). For the particular interest of this paper they face similar problems as the Partition Theory (G&S, 1984).

In the following sections, I will propose an analysis for Hungarian focus with two distinct operators:  $\varepsilon\chi\mathcal{H}$  and  $\mathcal{O}N\mathcal{L}Y$ . The two operators get the same exhaustive semantic content defined by Groenendijk and Stokhof (1984), and in case that the two operators modify the same term, ‘only’ has no semantic but a pragmatic effect on the previous expectations. In this way we can explain certain differences in answers with identificational focus versus ‘only’ and we can interpret certain multiple focus constructions where the two focused constituents go together with two ‘only’s.

**3.1 Question–answer pairs** The first example where we have to distinguish bare (identificational) focus and ‘only’-sentences resides in question-answer pairs. According to G&S, (3b) and (3c) get the same interpretation involving one operator: *exh* or *only*. For the question in (3a) the answers with or without ‘only’ are semantically equivalent, saying that Anna and nobody else called Emil. The focus in (3b) expresses exhaustive identification, thus the interpretation is  $\forall x[\text{called}(x, e) \leftrightarrow x = a]$ . In example (3) this seems to be not problematic, since both sentences are equally felicitous answers. This suggests that a sentence with bare (identificational) focus and an ‘only’-sentence are the same, so the appearance of ‘only’ in (3c) does not make any difference.

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| (3) a. Ki hívta fel Emilt?<br>who called VM Emil.acc<br>‘Who called Emil?’ | b. ANNA hívta fel Emilt.<br>Anna called VM Emil.acc<br>‘It is Anna who called Emil.’      |
|  | c. Csak ANNA hívta fel Emilt.<br>only Anna called VM Emil.acc<br>‘Only Anna called Emil.’ |

Consider, however, example (4) where the same question is posed in plural, so we have an explicit expectation of more persons who called Emil.

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| (4) a. Kik hívták fel Emilt?<br>who.pl called.pl VM Emil.acc<br>‘Who called Emil?’ | b. #ANNA hívta fel Emilt. (=3b)     |
|  | c. Csak ANNA hívta fel Emilt. (=3c) |

Question (4a) cannot be answered with a bare identificational focus (4b), but with ‘only’ is felicitous (4c). Considering the above example I propose that it is not the ‘only’ that is responsible for the exhaustive meaning. The function of ‘only’ here is cancelling the expectation.

Semantically we have two operators –  $\varepsilon\chi\mathcal{H}$  and  $\mathcal{O}N\mathcal{L}Y$  – that have the same exhaustive content as defined by G&S. Thus, semantically both sentences get the interpretation that nobody else but Anna called Emil, but the ‘only’ in (4c) has a pragmatic effect on top of it, saying that it is against the expectations. According to this proposal in these cases it is not the focus particle ‘only’ that is the main responsible for the exhaustive meaning, exhaustivity comes from the semantics of the identificational focus. The exhaustivity operator defined by G&S filters the minimal element of a set of sets. Accordingly, if we apply it twice on the same term we get the same semantic interpretation:  $\varepsilon\chi\mathcal{H}(\varepsilon\chi\mathcal{H}(\alpha)) = \varepsilon\chi\mathcal{H}(\alpha)$ . In this way semantically both (4b) and (4c) get the same interpretation as:  $\forall x.\text{called}(x, e) \leftrightarrow x = a$ . The difference between the two sentences is of a *pragmatic nature*, which is a consequence of the appearance of ‘only’.

The analysis along G&S goes as follows. In the partition semantics the meaning of an interrogative determines what its possible complete semantic answers are. The semantic interpretation of an interrogative is an *equivalence relation* over the set of possible worlds, thus an interrogative sentence denotes a *partition* of logical space. Every block of the partition induced by  $?\phi$  contains the possible worlds where the extension of  $\phi$  is the same, thus the meaning of a question is a set of propositions, the set of complete semantic answers to the question:  $\llbracket ?\vec{x}\phi \rrbracket = \{(w, v) \in W^2 \mid \llbracket \lambda\vec{x}\phi \rrbracket^w = \llbracket \lambda\vec{x}\phi \rrbracket^v\}$ . The focus expresses exhaustive identification, thus it contains an exhaustivity operator. Consequently, the proposition that a sentence with identificational focus denotes is one of the propositions in the partition induced by the underlying question. Thus identificational focus selects one block from the partition, or equivalently, it eliminates all blocks but one from the partition. In case of (3b) the focus selects the block containing the proposition *only Anna called Emil*.

Question (4a) is posed in plural, so it has an explicit expectation from the questioner’s side: (s)he thinks that there was more than one person (from the relevant domain) who came. This expectation should be interpreted as a *restriction* on the partition. For the identificational focus in the answer only the restricted area is accessible to select a block. Therefore we cannot reply to (4a) with (4b), because the block where the proposition is *only Anna called Emil* is not among the available ones. In fact, for question (4a) it is not excluded to give an answer that expresses that Anna and nobody else called Emil, but in case of (4a) we need ‘only’ to go explicitly against the previous expectation of the questioner as in (4c). Thus ‘only’ cancels the restriction, whereby the blocks which were excluded before can “pop-up” again, so they become accessible for the identificational focus to select one of them. It follows that the exhaustive identification – namely selecting a block from the partition – is the function of the identificational focus, and ‘only’ has an additional pragmatic effect on the domain restriction.

**3.2 Multiple foci** An other example from Hungarian in favour of the distinction of  $\varepsilon\mathcal{X}\mathcal{H}$  and  $\mathcal{O}\mathcal{N}\mathcal{L}\mathcal{Y}$  can be found in multiple focus constructions. In case of sentences containing two (or more) prosodic foci there are two possible interpretations: the two foci can form a complex focus where semantically a pair of constituents is in focus (5), or the first focus-phrase takes scope over the second one (6).

- (5) pair-reading (complex focus)
- a. John only introduced BILL to SUE. (from Krifka 1991)
  - b. ANNA hívta fel EMILT.  
Anna called VM Emil.acc  
'It is the Anna, Emil pair of whom the first called the second.'
- (6) scope-reading (double focus)
- a. Even<sub>1</sub> JOHN<sub>1</sub> drank only<sub>2</sub> WATER<sub>2</sub>. (from Krifka 1991)
  - b. Csak ANNA hívta fel csak EMILT.  
only Anna called VM only Emil.acc  
'Only Anna called only Emil. [the others nobody or more persons]'

The above examples show that these two different readings are present in Hungarian. However, interestingly, example (7) can have both readings: the scope-reading (7a) and the pair-reading (7b).

- (7) Csak ANNA hívta fel csak EMILT. (=6b)  
only Anna called VM only Emil.acc
- a. 'Only Anna called only Emil.' [the others nobody or more persons]
  - b. 'It is the Anna, Emil pair of whom the first called the second.'

For multiple terms, G&S gives the generalized definition of exhaustivity ( $EXH^n$ ). This operator gives the right result for examples where exhaustivity applies to pairs, thus for example for (5b):

$$(8) (EXH^2(\lambda R[R(a, e)]))(\lambda x\lambda y.called(x, y)) = \forall x\forall y[called(x, y) \leftrightarrow [x = a \wedge y = e]]$$

This is the intended interpretation saying that the only pair of persons of whom the call-relation holds is: Anna and Emil. The problem arises if we try to get the meaning in (7b). In the G&S framework 'only' and the exhaustivity operator are not distinct, thus the two 'only's are the operators that exhaustify the phrases respectively:  $EXH(a)$  called  $EXH(e)$ . Following this, the interpretation of (7) goes as follows:

$$(9) (EXH(\lambda P.P(a)))((EXH\lambda P.P(e))(\lambda x\lambda y.called(x, y))) = \forall y[\forall x[\lambda y.called(x, y) \leftrightarrow x = a] \leftrightarrow y = e]$$

It says that only Anna is such that she called only Emil, so we get the 'scope-reading' (7a). Exhaustifying the terms separately we cannot get the complex focus interpretation (7b). As a solution we can suppose there is an exhaustivity operator that takes a pair of constituents and there are two 'only's modifying the two terms as above. In this way the semantic interpretation goes as follows:

$$(10) \varepsilon\mathcal{X}\mathcal{H}(\mathcal{O}\mathcal{N}\mathcal{L}\mathcal{Y}(anna), \mathcal{O}\mathcal{N}\mathcal{L}\mathcal{Y}(emil))(\lambda x\lambda y.called(x, y))$$

Like singular terms, multiple terms as well may need not only exhaustification of the  $\mathcal{O}\mathcal{N}\mathcal{L}\mathcal{Y}$  operators, but also exhaustification of the identificational focus –  $\varepsilon\mathcal{X}\mathcal{H}$  – on top of it. The exhaustification of the pair of exhaustified terms does not lead to scopal meaning, but gives the pair-reading:

$$(11) \varepsilon\mathcal{X}\mathcal{H}(\mathcal{O}\mathcal{N}\mathcal{L}\mathcal{Y}(\alpha), \mathcal{O}\mathcal{N}\mathcal{L}\mathcal{Y}(\beta)) = \varepsilon\mathcal{X}\mathcal{H}(\alpha, \beta)$$

With distinct  $\varepsilon\mathcal{X}\mathcal{H}$  and  $\mathcal{O}\mathcal{N}\mathcal{L}\mathcal{Y}$  operators we can account for both readings for (7), but we have to take into consideration the discourse-structure as well. An important fact is that in case of a scope-reading the second focus is always second occurrence, and the new information goes to the (identificational) focus position which is associated with an  $\varepsilon\mathcal{X}\mathcal{H}$  operator.

- (12) Q: Ki hívta fel csak Emilt?      A: Csak ANNA hívta fel csak EMILT.  
who called only Emil.acc      only Anna called VM only Emil.scc  
'Who called only Emil?'      # 'It is the Anna, Emil pair of whom the first called the second.'  
      'Only Anna called only Emil. [the others nobody or more persons]'

Following this proposal the interpretation goes as follows. For the pair-reading of (7b) both *Anna* and *Emil* are new information, so a pair of constituents,  $\langle Anna, Emil \rangle$  is in focus and associated with an  $\varepsilon\mathcal{X}\mathcal{H}$  operator, while both constituents are modified by 'only'. This gives us semantically the pair-reading.

$$(13) \varepsilon\mathcal{X}\mathcal{H}(\mathcal{O}\mathcal{N}\mathcal{L}\mathcal{Y}(anna), \mathcal{O}\mathcal{N}\mathcal{L}\mathcal{Y}(emil))(\lambda x\lambda y.called(x, y)) = \forall x, y[called(x, y) \leftrightarrow [x = anna \wedge y = emil]]$$

In the case of the scope-reading of (7a) only *Anna* is new information, so it will serve as (identificational) focus associated with  $\varepsilon\chi\mathcal{H}$ .

$$(14) (\varepsilon\chi\mathcal{H}(\mathcal{O}\mathcal{N}\mathcal{L}\mathcal{Y}(anna)))((\mathcal{O}\mathcal{N}\mathcal{L}\mathcal{Y}(emil))(\lambda x\lambda y.called(x, y))) = \forall y[\forall x[\lambda y.called(x, y) \leftrightarrow x = a] \leftrightarrow y = e]$$

Information structure plays a crucial role for the disambiguation between the pair-reading and the scope-reading. The different information structure is assigned by different intonation patterns.

**4. Multiple focus readings** For sentence (15) two different intonation patterns lead to two meanings. The first intonation pattern (pair-intonation) gives the pair-reading and the second intonation pattern (scope-intonation) gives the scope-reading. Consequently, intonation indicates the information structure. In case of the pair-intonation both focused constituents are new information which leads to the semantic interpretation that a pair of constituent is in (identificational) focus:  $(\varepsilon\chi\mathcal{H}^2((\mathcal{O}\mathcal{N}\mathcal{L}\mathcal{Y}(foc_1), \mathcal{O}\mathcal{N}\mathcal{L}\mathcal{Y}(foc_2))))(R)$ ; in case of the scope-intonation only the first focus is new information, the second one is second occurrence/old information which leads to the semantic interpretation of the scope-reading:  $(\varepsilon\chi\mathcal{H}(foc_1))((\varepsilon\chi\mathcal{H}(foc_2))(R))$ .

$$(15) \text{Csak ANNA hívta fel csak EMILT. (=7)}$$

H*-L	L	L-H%	H*-L $\Rightarrow$ ‘It is the Anna, Emil pair of whom the first called the second.’
H*-L	L	L	(H*-)L $\Rightarrow$ ‘Only Anna called only Emil. [the others more or nobody]’

Intonation has the role to yield the intended meaning, however, there is no one-to-one correspondence between intonation patterns and meanings, since if we drop the ‘only’(s): ‘(Csak) ANNA hívta fel EMILT’. the pair-intonation leads to the pair-reading, but the scope-intonation does not lead to the scope-reading.

This suggests that the scope-reading is only possible with ‘only’-phrases. It seems that to express scope-meaning without ‘only’ we need a special syntactic structure. For this special structure É. Kiss (1998) proposes an elegant syntactic analysis, where she claims that FP (Bródy 1990) iteration is possible. According to this analysis, the second focused constituent also moves to an FP position, while the verb moves to the first F-head going through the second one. This syntactic analysis assumes two FPs, hence two focus/exhaustivity operators, accordingly in the semantic interpretation we have two focussed elements where the first takes scope over the second one. This structure generates only the word order:  $[Foc_1 \text{ Verb } Foc_2 \text{ VM}]$ , but cannot give an account of the word order where the second focus is at the end of the sentence:  $[Foc_1 \text{ Verb VM } Foc_2]$ , which can get the scope-reading as well. For the latter Alberti and Medve (2000) gives a different syntactic analysis which they assign the pair-reading. They call this structure “mirror focus” construction versus the “double focus” construction from É. Kiss. The advantage of this analysis is that it assigns a different syntactic structure for the complex focus, where there is only one focus phrase and consequently only one focus/exhaustivity operator which is applied to an ordered pair of arguments. The disadvantage is that the above distinction suggest a correspondence between the two readings and the two structures respectively. However, the picture is not as simple as that, since it can be the case that structure  $[Foc_1 \text{ Verb } Foc_2 \text{ VM}]$  gets the pair reading or structure  $[Foc_1 \text{ Verb VM } Foc_2]$  gets the scope reading.

**5. Conclusion** In this paper we briefly investigated the semantics and pragmatics of ‘only’ and identificational/exhaustive focus in Hungarian. We proposed an analysis in the Partition Semantics framework (G&S 1984) with distinct  $\varepsilon\chi\mathcal{H}$  and  $\mathcal{O}\mathcal{N}\mathcal{L}\mathcal{Y}$  operators. In this way we can account for the difference between sentences with bare identificational focus and sentences with ‘only’ and we can also get the two different readings of multiple focus constructions with ‘only’.

In the presentation we will further investigate Hungarian focus structures and interpretations. The main aim is to give an analysis on the syntax-semantics interface following the semantic analysis of exhaustivity by Groenendijk and Stokhof and the syntactic analysis of Hungarian focus by É. Kiss and Horváth. The most interesting part of these investigations is the analysis of multiple focus constructions. Our claim is that in order to interpret multiple focus (in Hungarian) we have to take into consideration the different intonation patterns, the information structure, the occurrence of only, and the syntactic structure as well.

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