

# Exhaustivity operator(s) and Hungarian focus structure

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In current syntactic, semantic and pragmatic literature *focus*, ‘only’ and *exhaustivity* form 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 the exhaustive interpretation of answers is by Groenendijk and Stokhof (1984; 1991 – G&S henceforth), which is widely studied and used in recent work.<sup>2</sup> For many languages — e.g., Basque, Catalan, Greek, Finnish, Hungarian!— focus is a significant syntactic matter as well. The most prominent theories for Hungarian focus structure are in É. Kiss (1998), Horváth (2000) on syntax, Szabolcsi (1981) on the syntax-semantics interface and Szendrői (2001) on the syntax-phonology interface. 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 which gets an exhaustive interpretation.

The main aim of the paper is to investigate the semantics of ‘only’ and identificational focus in Hungarian. The paper is devoted to give an analysis in the Partition Semantics framework (G&S) with distinct **exh** and **only** operators. In this way we intend to give an explanation of (i) the difference between sentences with bare focus and sentences with ‘only’ and (ii) the two different readings of multiple focus constructions with ‘only’.

## 1 Focus in Hungarian

In Hungarian, as a discourse-configurational language (É. Kiss 1995), certain discourse-semantic information is mapped into the syntactic structure of the sentences as well. Hungarian has special structural positions for *topics*, *quantifiers* and *focus*. The special position for the focused element(s) is the immediate pre-verbal position. In ‘neutral sentences’ like (1), the immediate pre-verbal position is occupied by the verbal modifier (VM), whereas in focused sentences like (2), 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,<sup>3</sup> and receives an *exhaustive* interpretation.

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| (1) Anna felhívta Emilt.<br>Anna VM-called Emil.ACC<br>‘Anna called Emil.’ | (2) Anna EMILT hívta fel.<br>Anna Emil.ACC called VM<br>‘It is Emil whom Anna called.’ |
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In her 1998 paper, É. Kiss distinguishes two types of focus: *identificational focus* and *information focus*. Her main claims are that these two types are different both in syntax

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<sup>1</sup> See for example: von Stechow (1991) Krifka (1991), Rooth (1985).

<sup>2</sup> For example, by van Rooij and Schulz (to appear) on exhaustivity or Kratzer (2005) on questions.

<sup>3</sup> Here and further on small capitals indicate pitch accent.

and semantics. The main differences between the two types of focus in Hungarian are the following:

- (a) *identificational focus*: expresses exhaustive identification, certain constituents are out, it takes scope, involves movement and can be iterated;
- (b) *information focus*: merely marks the un presupposed nature, is nonrestricted, does not take scope, does not involve movement and can project.

The pre-verbal focus in Hungarian falls under the category of identificational focus. In the following we will concentrate on the pre-verbal (identificational) focus to point out several problems with its exhaustive interpretation and ‘only’. In Hungarian ‘only’ is always associated with identificational focus, it cannot go together with the *information focus*. Since in Hungarian both ‘only’ and identificational focus indicate exhaustivity, the question arises whether sentences with bare (identificational) focus (3) and sentences with ‘only’ (4) get the same interpretation or not, and if they are not the same, what the difference is.

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|---|--|
| (3) ANNA hívta fel Emilt.<br>Anna called VM Emil.ACC<br>‘It is Anna who called Emil.’ | (4) Csak ANNA hívta fel Emilt.<br>only Anna called VM Emil.ACC<br>‘Only Anna called Emil.’ |
|---|--|

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. Later on we will see that this view cannot be applied to some focus constructions in Hungarian.

An important question here is if ‘only’ in Hungarian has an exhaustive semantic content or not. If we suppose that identificational focus involves an exhaustivity operator and ‘only’ gets exhaustive semantics, too, then examples like (4) involve two exhaustivity operators. We will see in section 2 that this solution is not a problem for the semantics, since exhaustification of an exhaustified term does not have a semantic effect. I will propose an analysis for Hungarian identificational focus and ‘only’ with two distinct operators, **exh** and **only**. The two operators both get exhaustive semantic content, but **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.

## 2 Exhaustivity in Hungarian

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 their dissertation from 1984, Groenendijk and Stokhof give an elegant analysis of the exhaustification of answers. I would like to extend their analysis to apply it to focus,

especially 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 of a set of sets.

(5) **The rule of answer formation**

if  $\alpha'$  is the interpretation of an  $n$ -place term, and  $\beta'$  is the relational interpretation of an  $n$ -constituent interrogative, the interpretation of the linguistic answer based on  $\alpha$  in the context of the interrogative  $\beta$  is  $(EXH(\alpha'))(\beta')$ , where  $EXH$  is defined as follows:

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

$EXH$  applies to a term  $T$  (a set of sets of individuals), and returns another (unique) term  $T'$  for which the following holds:

- (i)  $T'$  is a subset of  $T$ , which is to say that every set of individuals in  $T'$  is also a set in  $T$ , and
- (ii) they are minimal sets in  $T$ , which means that for no set in  $T'$  there is a smaller set in  $T$ .

In this model,  $EXH$  equals the interpretation of ‘only’: ‘[...] the semantic content of  $EXH$  can be verbalized as the term modifier ‘only’ [...]’ (Groenendijk & Stokhof 1984: 295). If we give the answer  $Anna_F$  called *Emil* to the question *Who called Emil?*, then it is interpreted as *Only Anna called Emil*:

$$(6) \quad (EXH(\lambda P.P(\text{Anna}))) (\lambda x.called(x, \text{Emil})) = \\ \lambda P \forall x [P(x) \leftrightarrow [x = \text{Anna}]] (\lambda x.called(x, \text{Emil})) = \\ \forall x [called(x, \text{Emil}) \leftrightarrow [x = \text{Anna}]]$$

Along G&S both the interpretation of (3) and (4)<sup>5</sup> involves one  $EXH$  operator (7):

$$(7) \quad (EXH(\text{Anna}))(\text{called-Emil})$$

### 3 Focus and ‘only’ in Hungarian

In this section, I will propose an analysis for Hungarian where the two operators are distinct. In this way we can explain certain differences in answers with identificational focus versus ‘only’ (section 3.1) and we can interpret multiple focus constructions where the two focused constituents go together with two ‘only’s (section 3.2). My proposal is to assume two distinct operators: **exh** and **only**. The two operators get the same exhaustive semantic content defined by G&S. In case that the two operators modify the same term, ‘only’ has no semantic but a pragmatic effect on the previous expectations.

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<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.

<sup>5</sup> With the underlying question ‘Who called Emil?’.

### 3.1 Question–answer pairs

The first example where we have to distinguish between bare (identificational) focus and ‘only’-sentences comes from question-answer pairs. As we saw in the previous section, on the classical analyses (8a) and (8b) get the same interpretation involving one exhaustivity operator. For the question in (8) the answers with or without ‘only’ are semantically equivalent, saying that Anna and nobody else called Emil. The focus in (8a) expresses exhaustive identification, thus the interpretation is  $\forall x[\text{called}(x, e) \leftrightarrow x = a]$ . In example (8) this seems to be unproblematic, 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 (8b) does not make any difference.

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| (8) | Ki hívta fel Emilt?<br>who called VM Emil.ACC<br>‘Who called Emil?’ | a. | ANNA hívta fel Emilt.<br>Anna called VM Emil.ACC<br>‘It is Anna who called Emil.’      |
|     |   | b. | Csak ANNA hívta fel Emilt.<br>only Anna called VM Emil.ACC<br>‘Only Anna called Emil.’ |

Consider, however, example (9), where the same question is posed in plural, so we have an explicit expectation that more persons called Emil.

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|-----|---|----|----------------------------|
| (9) | Kik hívták fel Emilt?<br>who.PL called.PL VM Emil.ACC<br>‘Who called Emil?’ | a. | # ANNA hívta fel Emilt.    |
|     |   | b. | Csak ANNA hívta fel Emilt. |

Question (9) cannot be answered with a simple identificational focus, but (9b) — with ‘only’ — is felicitous. 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 of plurality. Semantically we have two operators — **exh** and **only** — that have the same exhaustive semantic content as defined by G&S. Thus, semantically both sentences get the interpretation that nobody else but Anna called Emil, but the ‘only’ in (9) 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 elements of a set of sets. Accordingly, if we apply it twice on the same term we get the same semantic interpretation:  $\mathbf{exh}(\mathbf{exh}(\alpha)) = \mathbf{exh}(\alpha)$ .<sup>6</sup> In this way (9a) and (9b) get the same semantic interpretation:  $\forall x.\text{called}(x, e) \leftrightarrow x = a$ . The difference between the two sentences is of a pragmatic nature, which is a consequence of the appearance of ‘only’.

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<sup>6</sup> The proof is rather straightforward:

1.  $\forall P(\mathbf{exh}(U)(P) \rightarrow U(P))$ . By definition of **exh**,  $U$  instantiates  $\mathbb{P}$ ;
2.  $\forall P(\mathbf{exh}(\mathbf{exh}(T))(P) \rightarrow \mathbf{exh}(T)(P))$ . Directly from 1., **exh**( $T$ ) instantiates  $U$ ;

In the partition semantics of G&S, 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  $?\varphi$  contains the possible worlds where the extension of  $\varphi$  is the same, thus the meaning of a question is a set of propositions, the set of complete semantic answers to the question:

$$\llbracket ?\vec{x}\varphi \rrbracket = \{(w, v) \in W^2 \mid \llbracket \lambda\vec{x}\varphi \rrbracket^w = \llbracket \lambda\vec{x}\varphi \rrbracket^v\}.$$

In case of a relevant set of three persons  $\{\text{Anna, Rena, Tomi}\}$ , the meaning of question (8) is an eight-block partition (*A*). Question (9) 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 who called Emil. This expectation should be interpreted as a *restriction* on the partition (*B*).

<i>A</i>		<i>B</i>	
<i>nobody</i>	<i>anna and rena</i>	<i>nobody</i>	<i>anna and rena</i>
<i>anna</i>	<i>anna and tomi</i>	<i>anna</i>	<i>anna and tomi</i>
<i>rena</i>	<i>rena and tomi</i>	<i>rena</i>	<i>rena and tomi</i>
<i>tomi</i>	<i>everybody</i>	<i>tomi</i>	<i>everybody</i>

The question in example (8) is equated with the partition *A*. The answer with 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 (8) the focus selects the block containing the proposition ‘only Anna called Emil’. In example (9), for the identificational focus in the answer only the restricted area (dashed lines) is accessible to select a block from. Therefore we cannot reply (9a) to (9), because the block where the proposition is ‘only Anna called Emil’ is not among the available ones. In fact, it is not excluded to give an answer to the question (9) expressing that Anna and nobody else called Emil, but then we need ‘only’ to go explicitly against the expectation of the questioner. 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 is

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3.  $\forall P(\mathbf{exh}(T)(P) \rightarrow \mathbf{exh}(\mathbf{exh}(T))(P))$ . Proof by contradiction: suppose this is not the case; then  $\exists P.\mathbf{exh}(T)(P) \wedge \neg\mathbf{exh}(\mathbf{exh}(T))(P)$ ; then (by definition of **exh**)

$$\exists P'((P' \neq P \wedge \forall x(P'(x) \rightarrow P(x))) \wedge \mathbf{exh}(T)(P));$$

but then  $\neg\mathbf{exh}(T)(P)$ ;

4.  $\mathbf{exh}(\mathbf{exh}(T)) = \mathbf{exh}(T)$  [from 2. and 3.].

the function of the (identificational) focus, and ‘only’ has an additional pragmatic effect on the domain restriction.

Given these observations, we may wonder ‘What is happening in (8)?’ In question (8), the questioner has no expectation about how many people came, but we can answer with an ‘only’-sentence. I claim that, in this case, the use of ‘only’ in the answer gives information about the answerer’s previous expectations, namely the answerer expected more people to come. But according to the questioner’s information state this additional information is irrelevant. Nevertheless, it shows, too, that (8a) and (8b) are slightly different, and the use of ‘only’ in (8b) is not redundant.

### 3.2 Multiple foci

Another example from Hungarian in favour of a distinction of **exh** and **only** 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 (10), or the first focus-phrase takes scope over the second one (11).

(10) **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.’

(11) **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 the two different readings are present in Hungarian, too. However, interestingly, example (11b) can have both readings: the scope-reading (12a) and the pair-reading (12b):

(12) 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 sets of relations. For example, for (10b):

$$(13) \quad (EXH^2(\lambda R[R(a, e)]))(\lambda x \lambda y. \text{called}(x, y)) = \\ \lambda R \forall x \forall y [R(x, y) \leftrightarrow [x = a \wedge y = e]] (\lambda x \lambda y. \text{called}(x, y)) = \\ \forall x \forall y [\text{called}(x, y) \leftrightarrow [x = a \wedge y = e]]$$

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 pair-reading of (11b), because in G&S ‘only’ and the exhaustivity operator are not distinct, the two ‘only’s are the operators that exhaustify the phrases respectively:  $EXH(a)$  called  $EXH(e)$ . Following this, the interpretation of (11b) according to G&S goes as follows:

$$(14) \quad (EXH(\lambda P.P(a)))(EXH\lambda P.P(e))(\lambda x\lambda y.called(x, y)) = \\ (\lambda P\forall y[P(y) \leftrightarrow y = a])(\lambda P\forall x[P(x) \leftrightarrow x = e])(\lambda x\lambda y.called(x, y)) = \\ \forall y[\forall x[\lambda y.called(x, y) \leftrightarrow x = a] \leftrightarrow y = e]$$

It says that only Anna is such that she called only Emil, so we get the ‘scope-reading’ (12a). Exhaustifying the terms separately we cannot get the complex focus interpretation (12b). As a solution, we can suppose that there is an exhaustivity operator that takes a pair of constituents, and there are two ‘only’s modifying the two terms as above. Like singular terms, multiple terms as well may need not only exhaustification of the **only** operators, but also exhaustification of the identificational focus (**exh**) on top of it. The exhaustification of the pair of exhaustified terms does not lead to scopal meaning, but gives the pair-reading:

$$(15) \quad \mathbf{exh}\langle \mathbf{only}(\alpha), \mathbf{only}(\beta) \rangle = \mathbf{exh}\langle \alpha, \beta \rangle$$

With distinct **exh** and **only** operators, we can account for both readings of (11b), but we have to take into consideration the discourse structure as well. An important fact is that in the case of a scope-reading, the second focus is always second occurrence, and the new information goes to the focus position which is associated with an **exh** operator. Following this proposal, the interpretation goes as follows. For the pair-reading (12b), both *Anna* and *Emil* are new information, so a pair of constituents,  $\langle \text{Anna}, \text{Emil} \rangle$  is in focus and associated with an **exh** operator, while both constituents are modified by ‘only’. This gives us the pair-reading semantically:

$$(16) \quad \mathbf{exh}\langle \mathbf{only}(\text{anna}), \mathbf{only}(\text{emil}) \rangle(\lambda x\lambda y.called(x, y)) = \\ \forall x, y[\text{called}(x, y) \leftrightarrow [x = \text{anna} \wedge y = \text{emil}]]$$

In the case of the scope-reading (12a), only *Anna* is new information, so it will serve as (identificational) focus associated with **exh**:

$$(17) \quad (\mathbf{exh}(\mathbf{only}(\text{anna})))((\mathbf{only}(\text{emil}))(\lambda x\lambda y.called(x, y))) = \\ (\mathbf{exh}(\text{anna}))((\mathbf{exh}(\text{emil}))(\lambda x\lambda y.called(x, y))) = \\ \forall y[\forall x[\lambda y.called(x, y) \leftrightarrow x = a] \leftrightarrow y = e]$$

Thus, information structure as well plays a crucial role for the disambiguation between the pair-reading and the scope-reading.

### 3.3 Further issues

Next to the distinguished **exh** and **only** operators, there are important linguistic factors which determine the two different multiple focus readings. In order to interpret multiple foci, we have to take into consideration (at least) three factors: intonation, syntactic structure and the appearance of ‘only’. In the first place, intonation seems to have a very

important role here, since there are two different intonation patterns that lead to two different meanings. If both focussed constituents get pitch accent, there is a little stop (end of an intonation phrase) before the second focused element, and just before this break there is a rising intonation, we get the complex focus (pair) reading (18); and if all words between the focussed constituents are deaccented and there is no break, we get the double focus (scope) reading (19):

- (18) Csak Anna hívta fel Emilt.                      (19) Csak Anna hívta fel Emilt.  
           H\*-L L      L-H% H\*-L    H\*-L L      L H\*-L

Consequently, intonation indicates the information structure, i.e., if both focused constituents are new information or only the first focus. Intonation has the role to yield the intended meaning, however, there is no one-to-one correspondence between intonation patterns and meanings. The pattern in (18) is strong, it always gives the pair-reading, but the intonation pattern (19) is weak, the syntactic structure and the appearance of ‘only’ has a strong effect on it. These three linguistic factors play a role *together* in the interpretation of multiple focus constructions. For a more extended discussion on this topic see Balogh (2006).

#### 4 Conclusion

In this paper I investigated the semantics and pragmatics of ‘only’ and identificational focus in Hungarian. I proposed an analysis in the Partition Semantics framework of Groenendijk & Stokhof (1984) with distinct **exh** and **only** 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’.

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