

# Explicit and Implicit Exhaustivity in Focus

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## Abstract

Previous work on exhaustivity has often blurred the notion of exhaustivity with focus in a uniform analysis of the two. In this paper, I will refine the distinction between focus and exhaustivity and draw a further distinction between types of exhaustivity in focus environments. Experimental data from Greek Cypriot adults supporting this proposal will be presented. These data, and other from languages using similar focus strategies, show that exhaustivity effects vary based on different focus environments. Exhaustivity effects appear to be uniformly strong with *only*, but the effect of exhaustivity is weaker with clefts and bare intonation focus. The paper contributes to the already existed theoretical and experimental literature exploring the nature of exhaustivity, argues against stricter theories positing a uniform treatment of exhaustivity with focus and divides exhaustivity into an implicit and explicit type based on whether exhaustivity is an entailment (*only*) or implicature (clefts, prosodic focus).

## 1 Introduction

Exhaustivity, as a term, has been widely overgeneralized in the literature and overseen as a property of focus. As it is often discussed as only a part of focus, exhaustivity is often assumed to be the property that provides the added meaning of everything with the property X participating in the given context and is commonly found in questions and focus structures. Focus constituents, or in more technical terms structures or words *associated with focus* (Jackendoff, 1972), involve items or certain syntactic configurations that traditionally show semantic effects of focus.

Exhaustivity was firstly seen as a syntactic phenomenon following the assumption of a Foc position in the syntax. It was, therefore, argued in the past that exhaustivity can have its own projection with a null operator that provides the exhaustive reading in focus environments (Szabolcsi 1981b, Horvath 2000). In other cases, it has been treated as a syntactic feature of structural focus (Kiss 1998), relating to a syntactic approach to exhaustivity. Other approaches have dealt with the interpretation of focus as always being exhaustive and have posited an exhaustivity operator equivalent to *only* (Chierchia et al. 2013), to capture the effect.

The general nature of the claims above underlies one of the core claims of the paper and the challenging of the assumption that all focus structures that are prototypically found

with exhaustivity show the same degrees of exhaustivity within and across languages and structures. In fact, what will be explicitly argued here is, that not all focus structures show semantic effects of exhaustivity and that exhaustivity as a condition or property of the semantics of the sentence only appears in the case of focus functional operators (Beaver and Clark 2003) for the environments studied here. In other environments, it is a result of non-semantic factors and can be canceled or omitted (as also discussed in Wedgwood 2005). Based on this differentiation, exhaustivity, just like focus (Beaver and Clark 2003) cannot be treated uniformly, but considered in terms of its meaning as *Explicit Exhaustivity* or pragmatic properties as *Implicit Exhaustivity*. The paper will firstly discuss proposed theories of focus and exhaustivity and summarize the findings of recent experimental studies and then argue against the claim that focus structures make use of a covert *only* on the basis of the exhaustive interpretations that they carry.

By referring to focus structures here, I address syntactic and semantic configurations that are prototypically assumed to be as such (i.e. cleft structures), focus movement (i.e. DP fronting) and focus operators. Additionally, Cypriot Greek (hence, CG) makes extensive use of the focus or cleft particle *embu* (Grohmann et al. 2006 among others) and data related to it will also be presented here, but the main interest lies on the effects of focus particles as such. Last, phonological focus is also discussed and refers to a higher pitch on any phrase in the sentence (in this case, a DP) as a strategy adopted by speakers to express focus. The paper will thus address the above structures with regard to their meaning and interpretation of exhaustivity by a given population and compare the results with those found in Hungarian, German and French.

Section 2 will discuss the main arguments about theories of exhaustivity, as mentioned above, and data from Cypriot Greek related to the tests for showing exhaustivity. Section 2.1 summarizes previous experimental work. The motivation for this paper is based on this literature and the need to further explore these questions in the variety in discussion. Section 3 introduces the experimental task adopted by Onea and Beaver (2011) and replicated in CG and Sections 3.1-3.3 present the participants, the design and procedure of the experiment. Section 3.4 gives the results from the sample of data provided by Greek Cypriot speakers focusing on the exhaustivity effect in the different focus environments and Section 3.5 suggests another possible pattern from a second look in the individual responses of the subjects. The discussion of the results is provided in Section 4, which is divided in the comparison with previous experiments and the theoretical implications in Section 4.2. Data from this particular methodological approach to the measurement of exhaustivity are available for Hungarian and German (Onea and Beaver 2011) and French as well (Destruel 2012) and this provides the ground for a more general picture and cross-linguistic comparison. In addition, a comparison of the findings of this methodology with previous methodologies applied in a different sample of the same population and testing similar questions (Leivada et al., 2013; Pavlou et al., 2013) will be also provided. Section 4.2 will focus on the theoretical implications of the findings, setting a distinction of exhaustivity in two types, Explicit and Implicit Exhaustivity. Last, Section 5 summarizes the paper and the findings and posits some future questions.

## 2 Exhaustivity

Focus is often thought as accompanied by exhaustivity. Kiss (1998) argues that the preverbal focus position in Hungarian is associated with a [+exhaustive] feature. Exhaustive identification is defined as in (1):

- (1) *a focus operator which operates on the set of contextually determined elements for which the predicate of the sentence can potentially hold, and exhaustively identifies the proper subset of this set for which the predicate actually holds, excluding the complementary subset (as given in Kiss 2010).*

For Kiss (2010), preverbal focus in Hungarian is a specificational predicate and the focus referentially identifies the exhaustive set by the presupposed section of the sentence. Under this analysis, the exhaustivity of structural focus is not assigned by a focus operator (Kiss 1998), but a semantic condition of the specificational predicate role of the focused constituent.

The most recent approach to a possible null exhaustivity operator comes from Chierchia et al. (2013), who develop a more general approach of a grammaticalized *only* to produce scalar implicatures. In their paper, they argue that focus phenomena are independent evidence that a silent *only* exists. More specifically, they provide the following example:

- (2) a. So, did you see the students?  
 b. I saw [<sub>F</sub> Joe and Sue], where the constituent [<sub>F</sub> Joe and Sue] bears focal stress (Chierchia et al. 2013, p. 8)

Focus is not their main point of interest in their work, but it still predicts that the example above should always be interpreted exhaustively, if one assumes that the operator *only* semantically express exhaustivity. They explain that (3b) conveys unambiguously that B saw only Joe and Sue, in spite of the fact that there is no overt *only*. They speculate that focus activates alternatives and with those alternatives and a covert *only*, there is only one option available. In their theory, focus is a means of activation of alternatives and a silent *only* is the operator positing a restriction to the alternatives. In earlier work (Chierchia et al. 2009), they call the silent *only* operator an exhaustivity operator.

Exhaustivity has been largely seen as a syntactic feature (Kiss, 1998) or a syntactic position by positing a functional projection and a null operator. Similarly, Szabolcsi (1981a) claims that a PRO operator that is associated with a position F and has stress features in Hungarian provides the exhaustive listing of the salient subset. Therefore, in her account, when a constituent moves to a focus position is always interpreted exhaustively through the syntactic relation that holds between the focus position and the null exhaustive PRO. To capture the stress effects in pre-verbal and post-verbal focus in Hungarian, Horvath (2000) also posits an operator in syntax and claims that a phonological null Exhaustive Identification (EI) operator that projects a functional head gives the exhaustivity feature in focus positions. More specifically, she assumes that this functional projection is in the specifier of the EIP projection and sister to the focused DP. It requires the presence of prosodic Focus within a c-command domain, to primarily capture data from Hungarian. Horvath (2005) explains that the phonologically empty EI operator, which is ‘grammaticalized’ in the syntactic representation is similar to *only* and *even* for the cases of prosodic focus.

On the other hand, Wedgwood (2005) uses the examples first used in Horn (1981) to illustrate one of his arguments against an analysis involving an exhaustivity operator in focus. Horn (1981) provides a test for the encoded exhaustivity of English *it*-clefts, where *only* provides a lexical encoding of exhaustivity. The use of the cleft proves insufficient to produce the exhaustive reading that would give a coherent reading when the two clauses are connected.

- (3) a. ?I know Mary ate a pizza but I've just discovered that it was a pizza that she ate.  
 b. I know Mary ate a pizza but I've just discovered that it was only a pizza that she ate.

Horn concludes on the basis of these examples that exhaustivity in clefts may be a conversational implicature and speculates the complexity in processing the special syntactic properties of a cleft makes exhaustivity more difficult to cancel with a cleft than with a focus expressed by phonological emphasis. Just as in the Hungarian data provided by Wedgwood (2005), the CG data follow Horn's arguments, as shown below.

- (4) a. ? Ksero oti i Maria efaen fasoles, alla molis  
 know.1SG that the.NOM Maria.NOM ate.3SG beans.ACC, but just  
 anakalipsa oti en fasoles pu efaen.  
 discovered.1SG that is.3SG beans.ACC that ate.3SG  
 'I know that it is beans that Maria ate, but I just discovered that it was beans she ate.'
- b. Ksero oti i Maria efaen fasoles, alla molis  
 know.1SG that the.NOM Maria.NOM ate.3SG beans.ACC, but just  
 anakalipsa oti en monon fasoles pu efaen.  
 discovered.1SG that is.3SG only beans.ACC that ate.3SG  
 'I know that it is beans that Maria ate, but I just discovered that it was only beans she ate.'

Based on the contrast in (4), if exhaustivity was a condition of cleft, (4a) and (4b) should be equally acceptable. The fact that they are not, shows exactly that the exhaustivity encoded in *only* gives a different interpretation to the second sentence, while the cleft does not.

These theoretical concerns as well as the common conclusions drawn from empirical findings lead to further attesting these claims in other languages, such as CG, and questioning previous theoretical approaches to the phenomenon of exhaustivity. The experiment following will provide the data to support the argument that exhaustivity does not function in the same way in all focus environments. In fact, the exhaustivity effect with *only* is lexically encoded (hence, Explicit), but exhaustivity in other structures is pragmatically inferred (hence Implicit).

## 2.1 Experiments on Exhaustivity

The idea for conducting an experiment solely for investigating the interpretation of exhaustivity in the current paper was inspired from previous work (Pavlou et al. 2013), which first

made the observation that CG clefts appeared to be non-exhaustive. That study used exhaustivity as a means of testing the syntactic structure of the CG *embu* as an underlying cleft sentence or as a fossilized element. That task was administered online, with the presentation of short stories which were then followed by sentences. The speakers had to judge whether a sentence was true or false according to the story. Surprisingly, the hypothesis that the exhaustivity condition is always necessary for the cleft was not confirmed. Instead, the results showed variation between clefts as sometimes exhaustive and other times non-exhaustive. More specifically, adults of age 45+ accept less non-exhaustive clefts, but adults belonging in the age group of 18-30 and 30-45 accept more and at similar rates non-exhaustive clefts in this study. This creates then the question whether exhaustivity belongs in the semantics of focus and if so, what the constraints for its appearance are. If exhaustivity is not what is thought to be, then its redefinition and understanding of the context that it can appear is needed.

On a similar note, Onea and Beaver (2011) (also, Onea 2009) wanted to test if the immediately pre-verbal position for focused expressions in Hungarian is interpreted exhaustively (Kiss, 1998), as if it is in the scope of *only*. This study aimed to attest the claim that immediately pre-verbal focus is semantically exhaustive and if exhaustivity is part of the truth conditions of the sentence. Their methodology used natural correlation to judgments of truth and falsity through agreement and disagreement in the conversation. Therefore, the question whether the participant judges an utterance as true or false in that situation might be settled by looking at the extent to which a participant expresses agreement or disagreement, given a forced choice. If they contradict the sentence, then there is incompatibility between the sentence and the given situation. The experimental results showed that immediately pre-verbal focus in Hungarian is significantly less likely to be contradicted for not being exhaustive than *only*-sentences, and that the exhaustiveness effect associated with pre-verbal focus in Hungarian is much stronger than the exhaustiveness effect associated with prosodic focus in German.

Destruel (2012), in the replication of the Onea and Beaver (2011) which included French clefts as an additional condition, found that the results of the experiment clearly show that the exhaustivity effect associated with a cleft is not as strong as the one associated with an exclusive *only*, but much stronger than an underspecified sentence. The results support the prediction that speakers are more likely to overtly contradict a semantically exhaustive sentence (i.e. sentences with an exclusive) than other types of sentences.

These three different studies lead to the same question: What is the nature of exhaustivity and how can we predict its appearance in the different contexts? The different experiments tested several conditions in different populations. The aim of the current experiment is to test all the different focus conditions together and measure the difference between them in order to provide the full picture for the understanding of the different interpretations. The goal here is to define what exhaustivity is for CG focused expressions and compare the results with other languages, where this experiment is already attested.

### 3 The experimental task

In an attempt to test the research questions above, Onea and Beaver’s (2011) experiment was adopted in CG. This follows a forced-choice methodology, as in the original experiment, to avoid any metalinguistic judgments appearing in truth value judgment tasks requesting a ‘True’ or ‘False’ answer. A detailed description of the experiment is given in the subsections below.

#### 3.1 Hypotheses and Design

The experiment’s goal is to address the question whether exhaustiveness effects associated with focus are pragmatic or semantic in nature and to measure the difference between the different focus structures. The experiments are based on the research questions above, summarized here: If exhaustiveness is a truth conditional effect associated with focus, and if evidence is given that a sentence is incorrectly non-exhaustive, then the participants would contradict a focused expression that is not exhaustive. The null hypothesis, born out of these research questions, is that exhaustivity has the same effect across all conditions.

The design of the experiment largely follows the original experiment in Onea and Beaver (2011), but differs in the number of conditions involved. The current experiment has 5 major conditions with 2 sub-conditions in each. The conditions involved are (a) sentences using the exclusive operator *only*, (b) the CG focus particle *embu*, (c) cleft sentences, (d) sentences with prosodic focus and (e) default sentences, characterized by the unmarked word order. The unmarked word order here is taken to be VOS (Plunkett and Pavlou, in progress). The sub-conditions involved are subject and object sentences for all the attested conditions (only object sentences are given as examples here) and all conditions are within subject.

##### A. *Only-sentences*

- (5) Monon to ermarin esasen o Yannis.  
 only the.ACC closet.ACC fixed.3SG the.NOM John.NOM  
 ‘John fixed only the closet.’

*Monon* ‘only’ here modifies the object DP, which is moved to a focus position above TP.

##### B. *Embu-sentences*

- (6) Tes fasoles embu ekrušen o Kullis.  
 the.ACC beans.ACC embu.FOC burned.3SG the.NOM Kullis.NOM  
 ‘It is the beans that Kullis burned.’

The focused DP appears in a focus position above TP, since it precedes the focus particle *embu* in C.

##### C. *Cleft sentences*

- (7) En to ermarin pu esasen o Yannis.  
 is.3SG the.ACC closet.ACC that burned.3SG the.NOM John.NOM  
 ‘It is the closet that John burned.’

Cleft sentences follow English type clefts, namely introduced with an *it*-clause, which is omitted here since CG is a null subject variety and followed by a secondary clause introduced by the complementizer *pu* ‘that’.

#### D. Prosodic Focus

- (8) TO ERMARIN esasen o Yannis.  
 the.ACC closet.ACC fixed.3SG the.ACC John.ACC  
 ‘THE CLOSET John fixed.’

Prosodic focus is focus expressed on the focused DP with an emphasis and a higher pitch on the voice. In the current study, we are mainly interested in the exhaustivity effects related to the type of focus rather than the phonological model behind it. Last, default sentences (non-focused sentences) followed the default word order, taken to be VOS, following Plunkett and Pavlou (2011).

So, the current experiment had 10 conditions in total (divided in 5 subject and 5 object clauses) with 3 repetitions for each one, hence making a total of 30 items for each subject. All subjects were presented with the same order of items. The design included 6 stories, using different names for the objects participating in each story, as well as different verbs.

Scenario	Individuals/Names	Verbs	Objects
Scenario 1	Kullis, Kostas	kruzo ‘burn’	luvin ‘black-eyed peas’, fasoles ‘bean’
Scenario 2	Maria, Olya	pit <sup>h</sup> ono ‘crash’	kafan ‘box’, potsan ‘bottle’
Scenario 3	Panik <sup>h</sup> os, Charis	akkano ‘bite’,	tashinopit <sup>h</sup> a , appiðin ‘pear’
Scenario 4	Yannis, Kostis	sazo ‘sazo’	ermari ‘closet’, motora ‘motorbike’
Scenario 5	Eleni,Olya	kundo ‘push’	sikla ‘bucket’, kup <sup>h</sup> a ‘bowl’
Scenario 6	Yorkos,Charis	andinasso ‘push’	halin ‘carpet’, patania ‘blanket’

**Table 1.** 6 scenarios in the experimental task

The stories were pseudo-randomized in such a way that the same story would not always appear in the 3 repetitions of each subject or object clause of each condition. In other words, scenarios [1-3] were used to form subject clauses in the conditions of *only*, clefts and prosodic focus. In the conditions of *embu* and default sentences, scenarios [1-3] were used to form object clauses. Scenarios [4-6] were used in all other cases: to form object clauses in the conditions of *only*, clefts and prosodic focus and subject clauses in the conditions of *embu* and default sentences. In addition to the 30 test items, there were 9 fillers in the experiment using intransitive verbs in a VS order, and the choice of the vocabulary used for objects and subjects sentences was pseudo-randomized. There was also a pseudo-randomization on the lexical item that was focused in each test item. Given that exhaustivity is the condition attested here, each scenario would focus on one individual or object from a list of individuals or objects in a given scenario (see also the Procedure section).

The condition sentences were given as the target sentence that should have been matched to the story. They were all recorded in order to capture the prosodic focus or emphasis expressed phonologically in one of the conditions. The DP-movement to a pre-verbal position also marks focus given that the assumed position in the unmarked order is post-verbally, but

the particular movement is characterized by phonological emphasis as well, as below.

- (9) O            KOSTIS    esasen    to            aftokiniton.  
 the.NOM Costis.NOM fixed.3SG the.ACC car.ACC  
 ‘COSTIS fixed the car.’

The option of having prosodic focus post-verbally exists, with the difference being that movement to a focus-associated position expresses a contrastive focus interpretation (*Kostis*, and not *Yannis*, fixed the car). To sum up, 5 conditions that are associated to focus were used in this experiment. The following section will introduce the procedure followed for all of these conditions.

### 3.2 Participants

The task was administered to 43 adult speakers of CG, aged 18–54. A division in age groups of 18-30 and 31+ was attempted, but no significant differences were found. Given the task and the fact that the sample consisted of adults, no grouping was deemed as necessary. Therefore, the subjects will appear in one group.

Age	Number	Male	Female	High School	University
18–54	43	12	31	11	32

**Table 2.** Participants in the current experiment

As seen in Table 2, there are 12 male speakers and 31 female speakers with 11 of them being high school graduates and 32 of them being University graduates. Participants were all born and raised in Cyprus and claimed Cypriot Greek as their native language. All speakers were approached by the researcher by e-mail or via social network websites and therefore the current location of the participant was not controlled or considered important for the purposes of the experiment.

### 3.3 Procedure

As explained before, the reasoning of the experiment was to get the hearer to contradict the sentence or not, or express her displeasure if she avoids complete contradiction. Overt contradiction (no) is expressed for serious types of disagreement and it would be expected when exhaustivity is required (i.e. *only*). If the exhaustiveness effect associated with focus is pragmatic as opposed to semantic (and cancelable), one would expect that people will react by expressing their displeasure, rather than a strong contradiction.

Participants were introduced to a brief setting suggesting that two people or two objects participate in a given action. They were then asked a question and were instructed to judge whether a given non-exhaustive response to the question is completely cancelable or can be accepted if more information is added. The example shows exactly how a participant was presented with a scenario and then was asked to judge a recorded question, by forcing her to choose one of the options from (A)-(D).



- (10) John fixed the closet and the motorbike.  
**Question:** What did John fix?  
**Recorded sentence:** John fixed only the closet.  
 A) Yes, John also fixed the motorbike.  
 B) Yes, but John also fixed the motorbike.  
 C) No. John also fixed the motorbike.  
 D) None of the above.

An example in CG corresponding to (14) is given below. The lack of a standardized spelling system for CG and the written nature of the experiment, forced the introduction of the sentences with latin characters, but following a close adaptation of the CG sounds (but, not IPA). This is a common way Greek Cypriot speakers use to write in online environments, social network websites and text messages. Previous studies have used this methodology in linguistic experiments (Leivada et al., 2013) and it has been argued to be a valid method to avoid any effects related to the competence of Greek Cypriot speakers in SMG with the use of the Greek alphabet. To give a better illustration, while the name John would be transcribed as /yannis/, the form used is ‘Giannis’, which is a closer form to the SMG spelling system of the name ‘John’. The use of the latin alphabet resembling the Greek standardized spelling system targets to be as close as possible to the common way of writing for Greek Cypriot speakers. Given the administration of the task through website environments, participants were not allowed to change their answer once submitting a response to a question and moving to the next one. Restrictions to changing a submitted answer were considered necessary, since subsequent test items could have triggered a possibly different answer to the test items already presented.

- (11) O Giannis esasen to ermarin tzie tin motoran.  
**Question:** Inda mbu esasen o Yannis?  
**Recorded sentence:** Monon to ermarin esasen o Giannis.  
 A) Ne, tzie esase tzie ti motora o Giannis.  
 B) Ne, alla esase tzie ti motora o Giannis.  
 C) Oi. Esasen tzie ti motora o Giannis.  
 D) Kanena pu ta pupano..

If speakers chose (C) as a possible continuation after the recorded sentence, then they were thought to contradict the previous sentence. If they chose (B), then they didn’t overtly contradict the sentence, but they expressed a displeasure due to their exhaustivity requirement and the lack of it in the previous sentence. If they chose (A), then there was no contradiction or displeasure, but simply an addition to the context. This procedure is therefore attempting to capture the normal reactions in a conversation and to show if exhaustivity is really required in these contexts. The following section will show the results of the experiment.

### 3.4 Results

This section provides a description and the analysis of the results obtained. To start with, we will first present the data regarding the two subconditions of the experiment: subject and object clauses. The overall results for the 10 conditions and then the 5 environments

(cleft, prosodic focus etc.). The results of a statistical analysis (2x5 ANOVA) show that there is a significant difference both between subject and object sentences, but also between the environments tested. It will be shown that for all environments, except *only*, the subconditions of subject and object sentences played a role and in this way shows the interaction between the 5 major conditions (environment) and their subconditions (subject and object).

The main effect of Subject and Object sentences reflects the observation that there is a general trend that subject conditions received stronger exhaustivity readings than the object conditions. Interestingly, this observation holds for all environments, except sentences with *only*. *Only*-sentences are treated the same in subject and object environments by receiving a high number of ‘no’ responses. Object sentences show higher percentages (a 10% difference and more) in all other conditions for ‘Yes, but’ responses. In other words, subject sentences received more answers expressing overt contradiction, or in more linguistic terms, exhaustivity. Object sentences show higher percentages (a 10% difference and more) in all other conditions for ‘Yes, but’ responses. In other words, subject sentences received more answers expressing overt contradiction, or in more linguistic terms, exhaustivity.

Overall, the responses given in each type of answer for the 10 different conditions are shown in the Figure below:

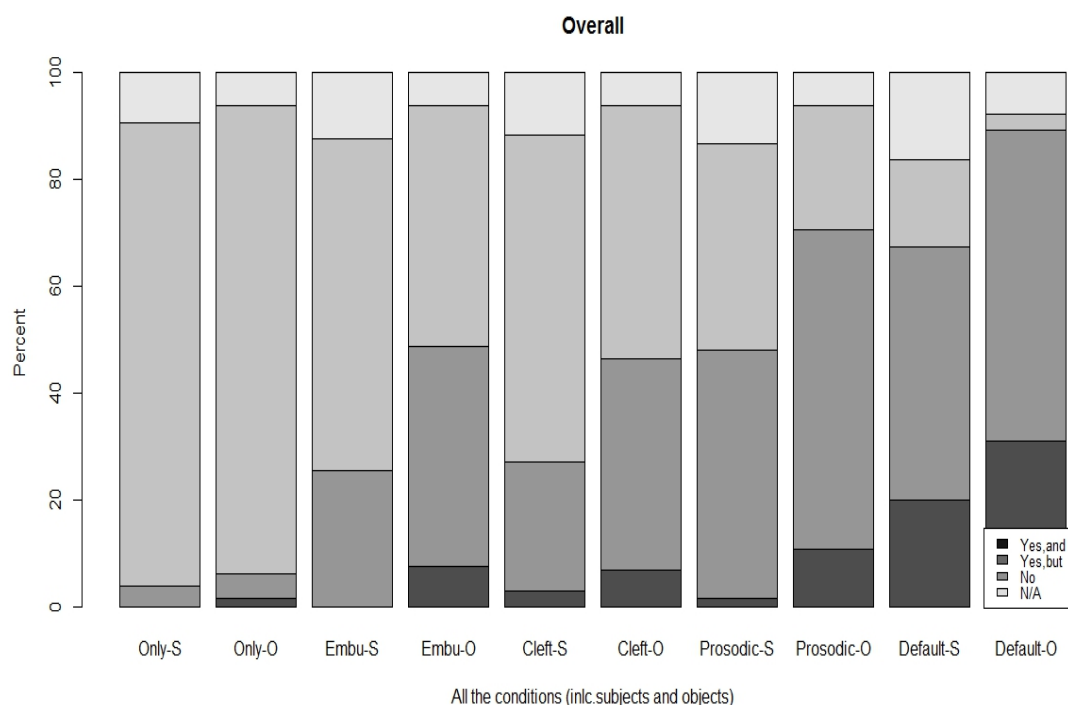


Figure 1: Overall Results for all conditions

Figure 1 shows the percentages of responses for all 10 conditions of the experiment. The object clauses in the cleft environment appear to receive more ‘No’ responses. In all cases, it appears that the exhaustivity effect is stronger in subject clauses (more responses of the ‘No’ type) than object clauses. All responses that received a ‘No’ response in any condition were coded as 1, which meant the expression of exhaustivity. All other responses were coded

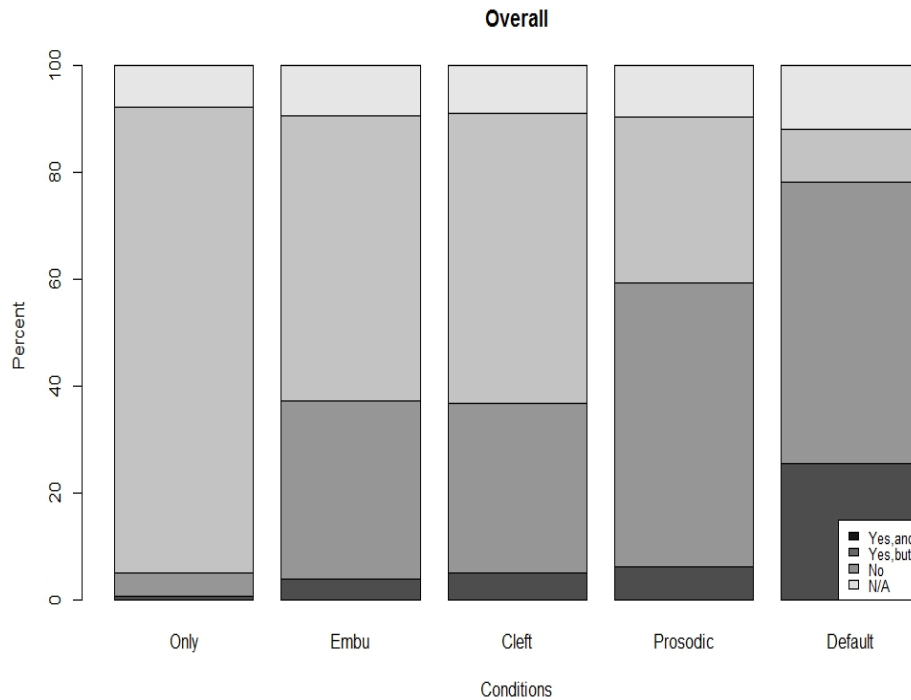
as 0 for no exhaustivity. A 5x2 ANOVA test showed that the effects of the subject and object sub-conditions were significant  $F(1,42)=22.239$ ,  $P<.001$ . Paired t-tests showed that the effect of subject and object environment was significant for all conditions, except *only*.

Environment	df=42
Cleft	$t = 3.3343$ , $p<.05$
Embu	$t = 3.0984$ , $p<.05$
Prosodic	$t = 2.8768$ , $p<.05$
Default	$t = 3.4098$ , $p<.05$

**Table 7.** Results from paired t-tests

Table 7 shows that there is statistical significance at the value of  $\alpha=.05$  regarding the exhaustivity effect in subject and object clauses. In contrast, the exhaustivity responses between subject and object clauses in the *only*-conditions are not statistically different.

The second step of analysis merged the subject and object sub-conditions in order to only examine the difference in the 5 environments.



**Figure 2:** Overall Results for the 5 environments

The percentage for the ‘No’ response is the clear contradiction to the lack of exhaustivity that makes the hearer judge the utterance as false. When moving from left to right on the chart, the percentages for the contradiction (hence, the exhaustivity) is reduced. Sentences with *only* are judged as exhaustive, while sentences with the focus particle *embu* and cleft sentences are less exhaustive and are interpreted the same by the participants. This means that *only*-sentences have received a higher number of continuation responses involving ‘No’

sentences. As we perceive the ‘No’ responses to be the clearest indication for contradiction of a non-exhaustive statement stating the need for the exhaustivity condition, we mainly focus on the change of that response across the conditions. Prosodic or phonological focus is interpreted as less exhaustive than other conditions. An ANOVA showed the effects of the environment was highly significant,  $F(4,168)=110.123$ ,  $p < .001$ . In follow-up paired comparisons, every other focus environment was compared to the *only*-condition, since the latter serves as a benchmark for exhaustivity. Given the difference in Figure 2, a comparison of clefts with the prosodic focus condition was also attempted. Paired t-tests showed that all conditions differ significantly with the *only*-sentences in both subject and object sentences (Table 8).

Comparisons	Subject (df=42)	Object (df=42)
Only-Cleft	$t=6.8013$ , $p<.001$	$t=7.7676$ , $p<.001$
Only-Embu	$t=5.5122$ , $p<.001$	$t=11.0104$ , $p<.001$
Only-Prosodic	$t=10.4876$ , $p<.001$	$t=13.4464$ , $p<.001$
Only-Default	$t=15.5788$ , $p<.001$	$t=34.4571$ , $p<.001$
Cleft-Prosodic	$t=5.2047$ , $p<.001$	$t=3.996$ , $p<.001$

**Table 8.** Results from paired t-tests/ Comparisons with *only* and the other environments

Table 8 shows that there is a significant difference between *only*-sentences and all other environments. While the *embu*-sentences and the cleft sentences had similar results and no significant difference between them in a paired t-test (Subject sentences:  $p>.1$ , Object sentences:  $p>.8$ ), there is a significant difference between cleft sentences and prosodic focus,  $t=5.2047$ ,  $df=42$ ,  $p<.001$ . This difference is the result of the phonological factors involved in Prosodic Focus, which makes it a different case than the syntactically encoded focus in clefts.

The data and statistical analysis provided here show a rejection of the null hypothesis assuming that there is no difference in the exhaustivity effects between the different conditions. Instead, the alternative hypothesis is that exhaustivity is different in subject and object clauses (in all environments, except the *only*-condition) and it is also different in the 5 different focus environments. These results validate the interaction of the conditions involved and create new findings regarding observations that have not been previously noted (e.g. difference in the exhaustivity interpretation according to the environment).

### 3.5 Strong vs. Weak Exhaustivity: An Alternative Analysis

The data presented so far are based on the division of responses by the participants in a particular way that clearly explains the assumption of the presence or absence of the exhaustivity condition. Alternatively, it could be argued that the ‘Yes,but’ type of responses show some degree of exhaustivity, but a weaker form of it than the one found in strong exhaustive statements expressed with ‘No’ responses.

In the data following, responses of the type ‘Yes,but’ and ‘No’ were coded as exhaustive and responses of the type ‘Yes, and’ were coded as non-exhaustive. A 5x2 ANOVA test showed that the effects of the subject and object sub-conditions that were found as significant with the first analysis (see section 3.4) were no longer significant with the re-coding

of the data. Further analysis of the data showed that the effect of the environment still remained significant, but only for responses to the *Only*-sentences when compared to prosodic focus and default sentences.

Comparisons	Subject (df=42)	Object (df=42)
Only-Cleft	t=1.6344, p>.05	t=1.8582, p>.05
Only-Embu	t=1.1593, p>.05	t=1.6664, p>.05
Only-Prosodic	t=2.2878, p<.05	t=2.2281, p<.05
Only-Default	t=4.9999, p<.001	t=5.6789, p<.001
Cleft-Prosodic	t=0.7709, p>.05	t=0.829, p>.05
Cleft-Emby	t=-0.4671, p>.05	t = 0.2554, p >.05

**Table 8.** Results from paired t-tests/ Comparisons with *only* and the other environments for the alternative analysis

These findings suggest that cleft sentences and focus particles like *embu* that intuitively express some exhaustivity indeed show some form of exhaustivity. We will draw the distinction, however, that this is weak exhaustivity that was not evident in a stricter analysis of the data in search of the exhaustivity condition. Prosodic focus was found to differ significantly from the strongest exhaustive environment (*Only*-sentences) in both analyses attempted here. One can therefore safely conclude that the environment of prosodic focus is not interpreted exhaustively (either strong or weak exhaustivity).

In the sections following, the division to strong and weak exhaustivity will be better explained in terms of differences on a theoretical basis, where strong exhaustivity (or Explicit exhaustivity) is exhaustivity that is semantically encoded, but weak exhaustivity (or Implicit Exhaustivity) is derived from pragmatic reasoning.

## 4 Discussion

The general conclusion that can be build from the set of data presented above is that exhaustivity does not appear to be a necessary condition in focus-associated contexts. In other words and in relation to the research questions (A) and (C), the data from CG show that exhaustivity can be canceled as other studies have also argued (Onea and Beaver 2011, De-struel 2012) and is therefore not necessarily part of the meaning and the semantics of a proposition. However, this does not mean that it cannot be part of the meaning at all. In the case of the exclusive *only* and based on the cross-linguistic data, it is concluded that exhaustivity is part of the semantics of focus. With regard to research question (B), cancellation of exhaustivity appears in the other conditions (clefts, focus particles and prosodic focus). Before interpreting these effects and the theoretical implications to the theory of exhaustivity, the following section will discuss the comparison between the current experiment and previous experiments.

## 4.1 Comparison with previous experiments

As a reminder to the reader, Onea and Beaver (2011) experiment had three conditions, including *Only*-sentences, pre-verbal prosodic focus on the subject and default intonation sentences. The results from their study show that immediately pre-verbal focus in Hungarian is less likely to be contradicted for not being exhaustive than *only*-sentences and that the exhaustiveness effect with pre-verbal focus in Hungarian is stronger than the exhaustiveness effect with prosodic focus in German. Based on the data, Onea and Beaver (2011) conclude that Hungarian focus is not semantically exhaustive and that pre-verbal focus in Hungarian is more exhaustive than prosodic focus in German.

Destruel’s (2012) experiment in French was using the same methodology attesting the conditions of *Only*-sentences with *seulement*, a canonical sentence (unmarked order) and cleft sentences and the continuation responses involved (a) *oui, et* ‘yes, and’, (b) *oui, mais* ‘yes, but’ and (c) *non* ‘no’. The results showed that the exhaustivity effect associated with a *c’est* cleft is not as strong as the one associated with an exclusive sentence with *seulement*. Destruel concludes that cleft sentences are associated with an inference that is cancelable.

When putting all of these sources together, that is the previous experiments (Onea and Beaver 2011, Destruel 2012) and the current one, the similarities in the results are very obvious. A visual illustration of the comparison is given in the table below.

Condition	Cypriot Greek	Hungarian	German	French
<b>Only</b>	87% ‘No’	82% ‘No’	100 % ‘No’	85% ‘No’
<b>Cleft</b>	54% ‘No’ 35% ‘Yes, but’			10% ‘No’ 60% ‘Yes, but’
<b>Prosodic focus</b>	31% ‘No’ 53% ‘Yes, but’	28% ‘No’ 46% ‘Yes, but’	4% ‘No’ 42% ‘Yes, but’	
<b>Embu</b>	53% ‘No’ 33% ‘Yes, but’			

**Table 9.** Cross-linguistic comparisons: Results from Onea and Beaver (2011) vs. Destruel (2012) vs. present study

Data from all languages tested had similar, if not almost the same, high rates for exhaustivity in sentences with *only*.<sup>1</sup> There is a difference, as the percentages for clefts showed 54% contradiction (Response (C)) here, but the French clefts did not show any contradiction at all, therefore no exhaustivity. With regard to ‘Yes, but’ responses, French speakers show higher rates of non-overt contradiction (60 %). Prosodic focus had similar percentages of contradiction in the current experiment (31%) and the experiment in Hungarian (28%). However, the German results (4 %) on the contradiction of prosodic focus were significantly lower than Cypriot Greek and Hungarian. The condition with the focus particle in the experiment was not included in any of the other experiments, therefore this merits more investigations for comparison with other languages. From the comparison above, the experiment confirms previous data and validates initial hypotheses about the variation that can be found in the interpretation of exhaustivity in focus-associated expressions.

<sup>1</sup>The percentages are an approximate of absolute numbers for some of the studies.

## 4.2 A distinction: Explicit and Implicit Exhaustivity

Previous literature (Wedgwood 2005) refers to inferred and encoded exhaustivity firstly discussed in Szabolcsi (1981a), hence drawing a distinction. This separation of inferred and encoded exhaustivity relates to the assumption of a functional exhaustive operator, which has been argued in previous works in syntactic and semantics analyses. Szabolcsi (1981a) discusses exhaustivity as an inference from implicature that contributes via encoding in the syntax to the compositional semantics of sentences. Wedgwood (2005) disagrees with this distinction and claims that exhaustivity is not encoded in syntax, specifically referring to the Hungarian pre-verbal position. The claim in Szabolcsi (1981a) that a PRO operator that is associated with a position F and has stress features in Hungarian to provide the exhaustive listing of the salient subset is not supported in the present analysis. While the operator is only structural in her work, it still imposes the interpretation of focus positions as always being exhaustive, a claim that has been disproven throughout the paper. Horvath (2005) explains that the phonologically empty EI operator, which is ‘grammaticalized’ in the syntactic representation is similar to *only* and *even*.<sup>2</sup> Just as with previous accounts, this approach can be falsified in the presence of the data presented here and other aforementioned experimental and theoretical arguments. The existence of such a functional projection in syntax would impose the necessary interpretation of focus as exhaustive, a fact that has been disproven in Hungarian (Onea 2007 among others) and other languages.

Given that both the cleft and the other two conditions targeting the Foc position in syntax have shown absence of exhaustivity, then exhaustivity is arguably not a syntactic feature. If it was a syntactic feature, then one would expect to always find it there, and not checking it at the relevant position or syntactic relation, would cause a derivation to crash. The conclusion, therefore, supports Wedgwood (2005) analysis that exhaustivity is not (at least solely) part of syntax. This brings further implications in discussion. While the claim is that exhaustivity is not part of the syntactic representation or any feature approach to it, the argument does not necessarily extend to focus. Focus can be seen as a syntactic feature or condition that drives movement in accounts considering focus to be structural (for example, Kiss 2009, Wedgwood 2005, Wedgwood 2009), but exhaustivity and focus can be seen as two separate conditions, even if exhaustivity appears in focus contexts. This separation of focus and exhaustivity leads to the following assumptions:

- (12) **Assumption 2:** Focus is essential for exhaustivity. It can be semantic or structural or phonological, but exhaustivity is not necessarily all of the above.

The distinction that will be drawn here concerns solely a theory of exhaustivity, and not of focus. We have already ruled out an analysis, where exhaustivity is neither a syntactic feature or a functional projection in a syntactic representation. In fact, the distinction that needs to be drawn to capture the facts is an interplay of semantics and pragmatics, or what will be called here, the *explicit* and *implicit* exhaustivity. Explicit exhaustivity refers to the *linguistically encoded context-free exhaustive listing of a salient subset from the meaning of a proposition*, while implicit exhaustivity refers to the *optionally exhaustive listing of a salient subset from the inferences drawn in context*. The latter, therefore, is not truth-conditional

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<sup>2</sup>This analysis does not hold for clefts and pseudoclefts according to Horvath (2000).

content of the utterance, but it is a conversational implicature that an utterance is likely to convey. In the remaining part, I will focus on the derivation of each kind of exhaustivity, supporting the above distinction.

To start with what appeared from the data to be the clearest and strongest environment for exhaustivity, the exclusive operator *only* always gives exhaustivity effects and therefore falls under the explicit exhaustivity category assumed here.

Traditional approaches to the semantics of *only* (Horn 1996) claim the differentiation between the presupposition and the assertion part of *only*. This approach captures the exhaustive reading of operators like *only*.

- (13) Monon o Panik<sup>h</sup>os esasen to ermarin.  
 Only. the.NOM Panik<sup>h</sup>os.NOM fixed.3SG the.ACC closet.ACC  
 ‘Only Panikos fixed the closet.’

According to Horn, (13) translates to (14) in the logical form and the meaning of *only* employs a universal quantifier and is equivalent to the negation of an existential.

- (14)  $\forall x[esasen.to.ermarin(x) \rightarrow x = Panikos] =$   
 $\neg \exists x[x \neq Panikos \wedge esasen.to.ermarin(x)]$

The prejacent of *only* is then the presupposition without the exclusive:

- (15) Monon o Panik<sup>h</sup>os esasen to ermarin.  
 Only. the.NOM Panik<sup>h</sup>os.NOM fixed.3SG the.ACC closet.ACC  
 ‘Only Panikos fixed the closet.’  $\rightarrow$  ‘Panikos fixed the closet.’

Giannakidou (2006) concludes that the step or inference from the *only*-sentence to the prejacent is veridical. Atlas (1991) (also, Atlas 1993) *only* is treated in a conjunctive logical form.

- (16) *Only* asserts:  
 $\exists x \forall y[(x = y \leftrightarrow Py) \& (Py \rightarrow y = a)]$   
 =Exactly one individual, and no other than a, has the property P.

This entails the prejacent of *only*. If the prejacent of *only* is an entailment, then the meaning of *only*, as Giannakidou (2006) argues, is:

- (17)  $\llbracket \text{Only Panikos} \rrbracket = \lambda P.P(Panikos) \wedge \neg \exists x[x \neq Panikos \wedge P(x)]$

While the approaches above capture the exclusiveness of *only*, they assume a negative component to capture the exhaustivity effect. As an alternative to that, the meaning of *only* in terms of quantification over propositions (Beaver and Clark 2008) can express the meaning of *only* as restricted by the activated alternatives to which the focal meaning refers.

- (18)  $\llbracket \text{Only S} \rrbracket = \forall p \in \text{ALT} \text{ true}(p) \rightarrow (p = S')$ , where  $S'$  is the ordinary meaning of the sentence  $S$ , and  $\text{ALT}$  is a salient set of alternatives which is a subset of the focal meaning of  $S$ . (Beaver and Clark 2008, p.30)



In earlier work, Beaver and Clark (2003) call operators like *only* focus functional operators and show that the stressed constituent is the semantic focus of the operator. Their analysis draws a distinction in the homogeneous class of focus operators, such as *only* and *always* and is in line with the distinction drawn for exhaustivity here. In other words, the focus operator *only* stipulates association with a focus constituent by means of its lexical properties and focus sensitivity and exhaustivity is not a uniform phenomenon. Exhaustivity, for focus functional operators like *only*, are therefore part of their lexical semantics as in (18).

A covert focus functional operator *only* for all cases of focus would derive the following semantics, as Onea (2007) explains:

$$(19) \quad \lambda P \lambda x P(x) \wedge \forall y P(y) \rightarrow y = x$$

Exhaustivity, however, only appears in the semantics of an overt lexical item *only*, while in the rest of the focus environments, such stipulation brings wrong predictions, given that exhaustivity is only optional.

Exhaustivity, in environments that do not encode it in their lexical semantics (hence, *Implicit Exhaustivity*), may be treated as a separate element from a meaning related to focus and can be captured, for example, with the model of the Question under Discussion. This should focus on the choice of alternatives in focus-associated contexts (Rooth 1992) and the salient answer to the question under discussion (In Beaver and Clark (2008), this is the Current Question), where the alternatives values for x are compared to the prejacent and ordered according to their strength. The reasoning behind the Question under Discussion is the "rather direct connection to crucial elements of the mutual cognitive environment that felicity in response to a real or imagined question can indicate something about the information structure of an utterance" (Wedgwood 2009, page. 105). A question, therefore, gives a set of possible answers with group of individuals or singletons:

- (20) **Question:** What did John burn?  
**Answer:** John burned only [the beans and the lentils]<sub>F</sub>.  
**Prejacent:** John burned X, X=beans,lentils  
 Stronger Alt.: {beans, lentils}  
 Weaker Alt.: {beans}, {lentils}

By generating a conversational implicature, the speaker would seek to be as informative as possible and would choose the stronger alternative in (20). The alternatives in this model are ordered by entailment, where the stronger alternative entails the weaker, and if a speaker accepts a weaker alternative, that is purely because it is an entailment of the stronger alternative and not because the speaker wishes to deny that John burned both the beans and the lentils or the set of them. The weaker alternative, of course, does not entail the stronger alternative, but given that each alternative is always compared with the prejacent (which lists the items of the strongest alternative), then the speaker is allowed to infer the possible weaker alternative as a logical entailment of the prejacent.

A pragmatics modeling that captures the empirical data presented in this paper allows us to draw the distinction between the explicit exhaustivity (lexical semantics) and the implicit exhaustivity (via means of pragmatic inference). This section has argued on the basis of theoretical and experimental arguments presented in the previous sections that exhaustivity,

just like focus (Beaver and Clark 2003), does not have a uniform analysis, but instead that explicit exhaustivity is encoded in the lexical semantics of focus functional operators like *only* or in the case of implicit exhaustivity, it is the strongest possible inference that can be drawn as a response to a relevant Question under Discussion.

## 5 Conclusion

This paper has discussed the variation found in the effects of exhaustivity in focused constituents, by presenting experimental data from Cypriot Greek and comparing them with previously published data from Hungarian, German and French. The variation appearing in the experimental studies shows that exhaustivity appears as part of the meaning of the proposition in some environments, while in others it appears to be optional or not necessary. It has been proposed that exhaustivity should not be dealt in a uniform analysis as part of focus, but that it is divided in two types, the *Explicit Exhaustivity* and *Implicit Exhaustivity*.

This proposal argues against approaches that assume a null exhaustivity operator or an exhaustive syntactic feature (Chierchia et al. 2013, Chierchia et al. 2009, Horvath 2000, Szabolcsi 1981b, Kiss 1998) and suggests that exhaustivity can be part of the lexical semantics in the presence of focus functional operators (Beaver and Clark 2003), or a pragmatic inference (Wedgwood 2005) in other environments, such as clefts, prosodic focus and the CG focus particle. Clefts and focus particles can be interpreted as non-exhaustive and sentences with prosodic focus appear as non-exhaustive as well, suggesting that exhaustivity in these cases can be canceled. The syntactic differences between these environments do not relate to the exhaustivity effect, but to structural focus. If the two should be treated in a uniform analysis, then exhaustivity should be found in every focus environment. This is clearly not the case for the data discussed here. This, therefore, suggests that exhaustivity and focus should be treated differently. Secondly, a uniform analysis cannot be provided for exhaustivity, as it can appear to be both a semantic and a pragmatic effect.

The division of exhaustivity in two types can be further attested in environments with wh-questions and partial responses, where exhaustivity is not a necessary condition in the response. In addition, data from other languages using an optional focus particle like the CG *embu* could contribute towards a better understanding of the different degrees of exhaustivity in different environments. Future work investigating exhaustivity effects in question-answer pairs in experimental setting following the distinction drawn here remains as future work.

## References

- Atlas, J. D. (1991). Topic/comment, presupposition, logical form and focus stress implicatures: The case of focal particles only and also. *Journal of Semantics*, 8:127–147.
- Atlas, J. D. (1993). The importance of being 'only': Testing the neo-gricean versus neo-entailment paradigms. *Journal of Semantics*, 10:301–318.
- Beaver, D. and Clark, B. Z. (2003). Always and only: Why not all focus sensitive operators are alike. *Natural Language Semantics*, 11(4):323–362.

- Beaver, D. and Clark, B. Z. (2008). *Sense and Sensitivity: How Focus Determines Meaning*. Blackwell, Oxford.
- Chierchia, G., Danny, F., and Benjamin, S. (2009). Hurford's constraint and the theory of scalar implicatures: Evidence from embedded implicatures. In Egret, P. and Magri, G., editors, *MITWPL 60*, pages 47–62. Cambridge, MA: MIT Press;.
- Chierchia, G., Danny, F., and Benjamin, S. (2013). Scalar implicature as a grammatical phenomenon. In Portner, P., Maienborn, P., and von Stechow, P., editors, *Semantics: An international handbook of natural language meaning*, pages 2297–2332. De Gruyter Mouton.
- Destruel, E. (2012). The french c'est clefts: an empirical study on its meaning and use. In Cormany, E., Ito, S., and Lutz, D., editors, *Empirical Issues in Syntax and Semantics 9*, pages 95–112.
- Giannakidou, A. (2006). Only, emotive factives, and the dual nature of polarity dependency. *Language*, 82:575–603.
- Grohmann, K. K., Panagiotides, P., and Tsiplakou, S. (2006). Properties of wh-question formation in cypriot greek. In Janse, M., Joseph, B., and Ralli, A., editors, *Proceedings of the Second International Conference of Modern Greek Dialects and Linguistic Theory*, pages 83–98.
- Horn, L. (1981). Exhaustiveness and the semantics of clefts. In *Proceedings of NELS 11*, pages 125–14.
- Horvath, J. (2000). Interfaces vs. the computational system in the syntax of focus. In Bennis, H., Everaert, M., and Reuland, E., editors, *Interface Strategies*, pages 183–206.
- Jackendoff, R. S. (1972). *Semantic interpretation in generative grammar*. Cambridge, Mass: MIT Press.
- Kiss, K. . (1998). Identificational focus versus information focus. *Language*, 74(2):245–273.
- Kiss, K. . (2009). Deriving the properties of structural focus. In Riester, A. and Onea, E., editors, *Focus at the syntax semantics interface*, pages 19–34.
- Kiss, K. . (2010). Structural focus and exhaustivity. In Zimmermann, M. and Fry, C., editors, *Information Structure. Theoretical, Typological and Experimental Perspectives*, pages 64–88. Oxford University Press.
- Leivada, E., Papadopoulou, E., and Pavlou, N. (2013). The gray area of acceptability judgments: Clefts and exhaustivity in cypriot greek. In Ihemere, K. U., editor, *Language Contact: A Multidimensional Perspective*, pages 59–86. Newcastle-upon-Tyne: Cambridge Scholars Publishing.
- Onea, E. (2007). Exhaustivity, focus and incorporation in hungarian. In Aloni, M., Dekker, P., and Roelofsen, F., editors, *Proceedings of the Sixteenth Amsterdam Colloquium*, pages 169–174.

- Onea, E. (2009). Exhaustiveness of hungarian focus. experimental evidence from hungarian and german. In Riester, A. and Onea, E., editors, *Focus at the syntax semantics interface*, pages 53–68.
- Onea, E. and Beaver, D. (2011). Hungarian focus is not exhausted. In Cormany, E., Ito, S., and Lutz, D., editors, *Proceedings of Semantics and Linguistic Theory(SALT)22*, pages 342–359.
- Pavlou, N., Leivada, E., and Papadopoulou, E. (2013). The cypriot embu and cleft sentences. an investigation of their (non)exhaustive properties. In Mark Janse, Brian D. Joseph, A. R. and Bagriacik, M., editors, *The 5th International Conference on Modern Greek dialects and Linguistic Theory*, pages 415–428.
- Plunkett, B. and Pavlou, N. (2011). Interpretation of ambiguous wh-questions in french and cypriot greek. Paper presented at the Workshop Syntactic Variation, Utrecht Institute of Linguistics-OTS, The Netherlands. December 10th.
- Rooth, M. (1992). A theory of focus interpretation. *Natural Language Semantics*, 1:75–116.
- Szabolcsi, A. (1981a). Compositionality in focus. *Compositionality in focus*, 10:141–162.
- Szabolcsi, A. (1981b). The semantics of topic-focus articulation. In Groenendijk, J., Janssen, T., , and Stokhof, M., editors, *Formal methods in the study of language*, pages 513–541.
- Wedgwood, D. (2005). *Shifting the Focus. From static structures to the dynamics of interpretation*. Elsevier.
- Wedgwood, D. (2009). Variation in focus. In Riester, A. and Onea, E., editors, *Focus at the syntax semantics interface*, pages 101–120.