EXHAUSTIVE IMPERATIVES

MAGDALENA SCHWAGER

Institut für Kognitive Linguistik
Johann Wolfgang Goethe-Universtität Frankfurt am Main
magdalena@schwager.at

Abstract. Usually imperatives show a tight link to necessity, but examples modified by *for example* provide evidence for possibility as their semantic core. It is argued that the possibility operator is normally turned into necessity by a covert exhaustifier whose application can be blocked by overt *for example*.

1. Introduction: a puzzle about *for example*

One way to understand **imperatives** is as formally identifiable sentence types that are prototypically used for requesting or commanding. These prototypical functions as well as more peripheral usages of the same sentence type (e.g. wishing, advising) express a restriction of the possible course of events such that what is requested, commanded, advised or wished for is true. Therefore, they are all naturally linked to necessity in semantics, and it seems straightforward to interpret an imperative ϕ! as constraining all accessible future courses of events to ϕ-courses (e.g. Asher and Lascarides 2003, Mastop 2005, Franke 2005). This makes straightforward predictions for most instances of imperatives and can even be extended to cover the somewhat marked permission usages as an indirect way of using necessity statements (cf. Schwager 2005b). Nevertheless, it fails to cover one reading of imperatives modified by *zum Beispiel* 'for example' in German, cf. (1).

(1) Kauf zum Beispiel keine Zigaretten!
buy.IMP for example no cigarettes
'For example, don't buy any cigarettes.'

Example (1) is ambiguous. As an answer to questions as in (2-a), it can be paraphrased as in (2-b). As an answer to (3-a), as in (3-b):

(2) a. Q_1: How could I stop smoking?/Q_1': What do I have to do in order to stop smoking?
b. One of the things you may not do is buy cigarettes. $\Box\neg BC(\textit{addressee})$
($\rightarrow$ *It is necessary that you don't buy cigarettes.*)

(3) a. How could I save money?
b. One of the things you could do is not buy cigarettes. $\Diamond\neg BC(\textit{addressee})$
($\not\rightarrow$ *It is necessary that you don't buy cigarettes.*)

So, (1) can either express that *not buying cigarettes* is part of the addressee's obligations, or that *not buying cigarettes* is a possibility to achieve the goal. On the second reading, not buying cigarettes is clearly not necessary. A semantics that relies on necessity fails to account for the reading exemplified in (3). The two variants of (2-a) show that the modal force is not automatically determined by the modal force of the question predicate (Q_1 contains possibility, Q_1' necessity as a question predicate; nevertheless, (1) is interpreted along the lines of (2-b) in both cases, that is, as expressing necessity).

The reading under which (1) is similar to (2-b) expresses that buying cigarettes is an **inexhaustive necessity** (that is, one obligation among others). The reading under which (1) is similar to (3-b) expresses that buying cigarettes is an **inexhaustive possibility** (that is, one possibility among others).

Before setting out for an analysis, it might be useful to take a look at their exhaustive counterparts. Example (4) displays **exhaustive possibility**:

(4) a. Q: What could I possibly do to stop smoking?
b. A: Du kannst nur aufhören, Zigaretten zu kaufen.
you can only stop, cigarettes to buy
'The only thing you can do is stop buying cigarettes.'

Example (4-b) expresses that the only possibility for the addressee to stop smoking is not to buy cigarettes anymore. The overt exhaustifier *only* is used to indicate exhaustivity. Consequently, if she wants to stop smoking, it is necessary that she doesn't buy cigarettes anymore. So, exhaustive possibilities come out as necessities that are not specified with respect to their degree of exhaustivity.

The unmodified necessity modal in (5) allows for an interpretation as **exhaustive necessity**. That is, given the task of getting into a good university, nothing is necessary apart from having a lot of money. The possibility of B's incredulous question clearly confirms the existence of such an interpretation.[1] But when overt *for example* forces a reading of inexhaustive necessity, B's incredulous question is completely incoherent (A's utterance has already indicated that having a lot of money may not be the only requirement to get into a good university).

(5) a. A: To get into a good university, you must have a lot of money. B: Really? And that's all?

[1] Nevertheless, it is most likely not part of the asserted proposition, as shown by B's correction in (i-a). Making exhaustive necessity explicit is not so easy though. Adding the exhaustifier *only* results in the **sufficiency modal construction** (cf. von Fintel and Iatridou 2005), cf. (i-b). But this does not only express that there are no other requirements than having enough money, but also that having enough money is ranked low on the scale of efforts.

(i) a. A: To get into a good university, you must have a lot of money. B: Yes, but there is more to it than that!
b. To get into a good university, you only have to have lots of money.

b. A: To get into a good university, you must for example have a lot of money. B: #Really? And that's all?

2. The proposal: diamonds for imperatives

In order to explain the ambiguity in (1), I want to argue that semantically imperatives express possibility with respect to a contextually given set of possible worlds. For the moment, I abstract away from their inherently non truth conditional character and treat them as modalized propositions.[2]

Possibility and necessity (as expressed also by modals like *must* and *may*) are analysed as propositional quantifiers relating a background and a complement propositions (cf. Geurts 1999). The modal element in an imperative ϕ! is assumed to consist in an imperative operator OP_{Imp} (cf. (6-c)). Its background b is typically interpreted as referring to the set of those worlds in the Common Ground that comply best with what the speaker wants, or in which the addressee reaches his current goal in a convenient way.

(6) a. $\Diamond = \lambda b \lambda p.(\exists w \in b)[w \in p]$
b. $\Box = \lambda b \lambda p.(\forall w \in b)[w \in p]$
c. $OP_{Imp} = \Diamond$

Exhaustivity and antiexhaustivity can now be treated as modifiers on propositional quantifiers. Both are of type $<<st,<st,t>>,<st,<st,t>>$ (s and t for worlds and truth values respectively).

Being an exhaustive possibility with respect to background b, $(EXH(\diamond))(b)$, can now be interpreted as *covering all of b*. This follows Zimmermann 2000's closure condition on lists of possibilities (cf. (7))[3]. Added to a list of possibilities $p_1, \ldots, p_n$, (7) expresses that this list is exhaustive in that the entire background b is covered by their union. (8) simplifies it to an operator over single possibilities, which (for non-empty backgrounds) gives us the equivalence in (9).[4]

(7) $(\forall q)[q \cap b \neq \emptyset \rightarrow [q \cap p_1 \neq \emptyset \vee \ldots \vee q \cap p_n \neq \emptyset]]$ his $(24\kappa')$

(8) $EXH(\Diamond) = \lambda b \lambda p.\Diamond(b)(p)$ & $(\forall q \in \Diamond(b))[q \in \Diamond(p)]$

(9) $EXH(\Diamond)(= EXH(OP_{Imp})) = \Box$

[2]Cf. Schwager 2005a for an elaboration of an additional presuppositional meaning component of imperatives that explains the inaccessibility of truth values.

[3]Zimmermann 2000 argues that for domains with mereological structure of propositions or locations, a simple general exhaustivity operator as proposed e.g. in Groenendijk and Stokhof 1984 cannot be applied. Although I cannot elaborate on this here, a more complex variant that takes into account comparative relevance (e.g. in terms of utility, cf. van Rooij and Schulz ta) should in principle be extendable to exhaustification with respect to properties like *being permitted* as well.

[4]For arbitrary $b(\neq \emptyset)$ and p: $(EXH(\Diamond))(b)(p) \Leftrightarrow \Box(b)(p)$. Proof: $\Rightarrow$ If $w \in b$, then $\{w\} \cap b \neq \emptyset$; but then, $\{w\} \cap p \neq \emptyset \rightarrow w \in p$. $\Leftarrow$ For non-empty b, $\Diamond(b)(p)$ follows. And if $w \in q \cap b$, then $w \in p$. Hence, $q \cap p \neq \emptyset$. (This is an adaptation of Zimmermann's proof for lists of possibilities.)

Now, we have to generalize the notion of exhaustivity of a modal relation from possibility to covering also necessity. *p is an exhaustive necessity with respect to background b*, ($EXH(\Box))(b)(p)$, shall be interpreted as *nothing follows from the background b that doesn't follow from p*.[5]

(10) $EXH(\Box) = \lambda b \lambda p.\Box(b)(p)\ \&\ (\forall q \in \Box(b))[q \in \Box(p)]$

From (8) and (10), we can generalize to the following modifier *EXH* of propositional quantifiers R:

(11) $EXH(R) = \lambda b \lambda p.R(b)(p)\ \&\ (\forall q \in R(b))[q \in R(p)]$

A natural interpretation for the antiexhaustifier *zum Beispiel* 'for example' is to assume that it modifies a propositional quantifier by adding that the speaker doesn't exclude that other propositions than the expressed argument proposition stand in the same relation to the background. This is spelled out in (12).

(12) $zB(R) = \lambda b \lambda p.R(b)(p)\ \&\ \Diamond(Bel_S)[\neg(EXH(R))(b)(p)]$,
where Bel_S is the set of the speaker's belief worlds.

So, for instance, if $p \in (zB(\Box))(\cap$*what is commanded*$)$, then p is an obligation, but the speaker doesn't exclude that there are further obligations independent of p.

Semantically, the imperative operator OP_{Imp} is equivalent to the modal verb *may*. Nevertheless, it differs in its interaction with (anti)exhaustification. OP_{Imp} combines obligatorily either with overt *zB* or with covert *EXH* (default). Only after doing so, it behaves like a modal in optionally combining with *EXH* or *zB*, before applying to background and complement proposition. The possible LF-schemata are given in (13) ($\emptyset$ indicates the absence of an (anti)exhaustifier at the respective position, and options are indicated in curly braces).

(13) a. $[\ [\ \{EXH, zB, \emptyset\}\ [\ \{EXH, zB\}(OP_{Imp})\ ]\ ]\ b\ p\ ]$
b. $[\ [\ \{EXH, zB, \emptyset\}\ [\ \{must, may, \ldots\}\ ]\ ]\ b\ p\ ]$

According to (13-a), in the absence of *zum Beispiel*, *EXH* has to apply to OP_{Imp}. Consequently, by the equivalence in (9), possibility is turned into necessity, giving the desired necessity reading for plain imperatives.

The ambiguity of (1) relies on the two positions available for *zB* with respect to OP_{Imp} (cf. (13)). If *zum Beispiel* serves as the obligatory modifier of OP_{Imp}, the imperative expresses true possibility, cf. (14).

(14) $zB(OP_{Imp}) = \lambda b \lambda p.\Diamond(b)(p)\ \&\ \Diamond(Bel_S)\neg(\forall q \in \Diamond(b))[q \in \Diamond(p)]$

According to (14), $(zB(OP_{Imp}))(b)(p)$ says that p is a possibility with respect to background b, but that the speaker holds it possible that parts of b are not covered by

[5] Most likely logical consquence is too strong and should ultimately be replaced by a context sensitive consequence relation.

p (consequently, that p is not a necessity). This accounts for reading (3-b).

The computation for the inexhaustive necessity reading individuated in (2-b) is a bit more complicated. In (16), *EXH* has applied to OP_{Imp} and has turned it into necessity, while *zB* occupies the position of the optional modifier above. Under the common pragmatic assumption spelled out in (15), this accounts for the reading of inexhaustive necessity.

(15) For any speaker S and any proposition A: $\text{utter}_S(A) \rightarrow \Box(\mathit{Bel}_S)A$.

(16) $\mathit{zB}(\mathit{EXH}(OP_{Imp})) =$ by *zB* in (12)

a. $\lambda b \lambda p.(\mathit{EXH}(\Diamond))(b)(p)$ & $\Diamond(\mathit{Bel}_S)[\neg(\mathit{EXH}(\mathit{EXH}(\Diamond)))(b)(p)] =$ by (9), (10)

b. $\lambda b \lambda p.\Box(b)(p)$ & $\Diamond(\mathit{Bel}_S)[\neg[\Box(b)(p)$ & $(\forall q \in \Box(b))[q \in \Box(p)]]$

By (15) and the first conjunct of (16-a), we know that $\neg\Diamond(\mathit{Bel}_S)\neg\Box(b)(p)$. By De Morgan's law, the last conjunct in (16-b) can then be simplified so as to give us (17):

(17) $\lambda b \lambda p.\Box(b)(p)$ & $\Diamond(\mathit{Bel}_S)[\neg(\forall q \in \Box(b))[q \in \Box(p)]]$

So, $\mathit{zB}(\mathit{EXH}(OP_{Imp}))(b)(p)$ says that p is a necessity with respect to b, but that the speaker does not exclude that further, independent propositions are b-necessities as well. This is exactly the reading of inexhaustive necessity we are after for (2-b).

Moreover, it is predicted correctly that application of *EXH* to any R that has been antiexhaustified by *zB* results in attributing contradictory beliefs to the speaker.

(18) $^{\#}\mathit{EXH}(\mathit{zB}(R)) =$ by (11)

a. $\lambda b \lambda p.(\mathit{zB}(R))(b)(p)$ & $(\forall q \in (\mathit{zB}(R)(b)))[q \in (\mathit{zB}(R))(p)] =$ by (12)

b. $\lambda b \lambda p.R(b)(p)$ & $\Diamond(\mathit{Bel}_S)[\neg(\forall q \in R(b))[q \in R(p)]]$ &
$(\forall q \in \{t \mid R(b)(t)$ & $\Diamond(\mathit{Bel}_S)[\neg(\forall q' \in R(b))[q' \in R(t)]]\})$
$[q \in \{s \mid R(p)(s) \& \Diamond(\mathit{Bel}_S)[\neg(\forall q' \in R(p))[q' \in R(s)]]\}]$

For arbitrary b and p, the last conjunct causes the contradiction. Insert p as a q. Due to the first two conjuncts, p passes the restriction ($R(b)(p)$, and $\Diamond(\mathit{Bel}_S)[\neg(\forall q' \in R(b))[q' \in R(p)]]$). Consequently, it should hold that $R(p)(p)$ - which might be true or not, depending on the nature of R, but crucially that $\Diamond(\mathit{Bel}_S)[\neg(\forall q' \in R(p))[q' \in R(p)]]$. Hence, applying *EXH* to an operator that has been antiexhaustified by *zB* attributes nonsensical beliefs to the speaker and is therefore most likely avoided.

3. Conclusion and outlook

EXH and *zB* as defined here allow us to compute the different modal forces observed with imperatives depending on the interaction of OP_{Imp} with *zum Beispiel*. This can't be obtained if imperatives are interpreted as always expressing necessity. *EXH* and *zB* carry over to modal verbs as well.

So far, this all happens in semantics, which is maybe not as it should be, especially if we take serious the observations concerning modal verbs. Further unification with other approaches to exhaustification and work on *only* remains to be done.

Empirically, it would be interesting to compare the proposal with exhaustivity in disjunctions (cf. Geurts ta), and to try to extend it to modal operators in Salish that (like imperatives) express necessity as a default but are interpreted as possibility when necessity gives rise to a contradiction (cf. Matthewson et al. 2005). Last but not least, the assumption of an exhaustivity operator in the imperative might shed new light on the interaction of imperatives with free choice items (cf. Menèndez-Benito 2005 for licensing of free choice items in connection with exhaustification).

Acknowledgements

For discussion and helpful comments I want to thank Rick Nouwen and Ede Zimmermann. Of course, the usual disclaimer applies.

Bibliography

Asher, N. and Lascarides, A.: 2003, Imperatives in dialogue, in P. Kuehnlein, H. Rieser, and H. Zeevat (eds.), *Perspectives on Dialogue in the New Millennium*, Benjamins, Amsterdam

von Fintel, K. and Iatridou, S.: 2005, *Anatomy of a Modal*, Ms., MIT

Franke, M.: 2005, *Pseudo-Imperatives*, MAthesis, ILLC Amsterdam.

Geurts, B.: 1999, *Presuppositions and Pronouns*, Elsevier, Oxford

Geurts, B.: t.a., *Entertaining Alternatives*, To appear in 'Natural Language Semantics'

Groenendijk, J. and Stokhof, M.: 1984, *Studies on the Semantics of Questions and the Pragmatics of Answers*, Ph.D. thesis, Amsterdam

Mastop, R.: 2005, *What can you do?*, Ph.D. thesis, ILLC Amsterdam

Matthewson, L., Rullman, H., and Davis, H.: 2005, *Salish Modal Operators*, Talk at ESSLLI 2005, Edinburgh

Menèndez-Benito, P.: 2005, *Freedom of Choice*, Talk at 'Sinn und Bedeutung 10', 13.-15. 10. 2005, Berlin

Schwager, M.: 2005a, *Interpreting Imperatives*, Ph.D. thesis, University of Frankfurt/Main

Schwager, M.: 2005b, Permitting permissions, in J. Gervain (ed.), *Proceedings of the 10th ESSLLI Student Session 2005, Edinburgh*

van Rooij, R. and Schulz, K.: t.a., *Pragmatic Meaning and Non-monotonic Reasoning: The Case of Exhaustive Interpretation*, To appear in 'Linguistics and Philosphy'

Zimmermann, T. E.: 2000, Free choice disjunctions and epistemic possibility, *Natural Language Semantics* 8, 255–290