

On the logical makeup of *how-* and *why-*questions*

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Abstract We employ *wh else*-phrases as a novel tool for investigating the logical makeup of *wh*-questions. Applying the *wh else*-diagnostic to *how-* and *why-*questions, we show that they comprise two different logical types, which differ in terms of whether or not two of their Hamblin answers can be compatible. *How-* and *why-*questions can also be classified in grammatical or notional terms (e.g., Higginbotham 1993, Oshima 2007, Sæbø 2016). Our findings therefore raise the question of how the logical typology and grammatical or notional typologies of *how-* and *why-*questions might be related.

Keywords: *how-*questions, *why-*questions, additive *else*, Hamblin answers

1 Introduction

The body of work on the semantics of *wh*-questions, sparked by classic works like Hamblin (1973), Karttunen (1977), and Groenendijk & Stokhof (1982, 1984), is substantial, yet most of this literature focuses narrowly on questions about individuals or degrees. In particular, discussion relating to the semantics of *how-* and *why-*questions – questions about *modes* and *reasons*, as we will say – has remained sporadic (e.g., Oshima 2007, Abrusán 2014, Sæbø 2016).¹ The reasons for this limitation presumably include the uncertainty regarding the contents of the propositions that constitute answers to *how-* and *why-*questions, which limits the utility of these questions in the investigation of certain general issues in the study of questions, most notably the semantics of question embedding.

In this paper, we aim to reduce this uncertainty by probing a particular aspect of the semantics of *how-* and *why-*questions, regarding the logical relation between their so-called Hamblin answers. Specifically, we will investigate whether it is possible

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¹ We intend this to be a claim about the linguistic literature. *How-* and *why-*questions have also been a topic in philosophy (e.g., Hintikka 1995, Shaheen 2010, Stanley 2011, and Skow 2016).

for more than one Hamblin answer to be true, or whether Hamblin answers are pairwise incompatible.

Hamblin answers to a *wh*-question are propositions obtained by ascribing the property expressed by the *wh*-phrase's scope – the question *nucleus* – to any of the entities in the *wh*-phrase's domain. To illustrate, in *Who attended?* the domain is the set of people and the nucleus expresses the property of attending. The set of Hamblin answers to this question accordingly contains for every person *x*, the proposition that *x* attended. In this example, the Hamblin answers are semantically unrelated. This implies, in particular, that any two Hamblin answers are semantically compatible (since it is possible for any two people to have attended). In contrast, any two Hamblin answers to *Who ate the most apples?* are semantically incompatible (since it is not possible for two different people to be the one who ate the most apples). Of course, for such *who*-questions, like other questions about individuals, there is nothing mysterious about the compatibility or incompatibility of Hamblin answers, since it is transparently determined by the nucleus' easily discerned semantic content.

What about *how*- or *why*-questions? Interestingly, *how*-questions have been the subject of a difference in opinion. Specifically, while Oshima (2007) argues that the inconspicuous question *How did Alice teach Max French?* can have at most one true Hamblin answer, Abrusán (2011) disagrees, suggesting that it is possible for more than one answer to be true. We should perhaps not be surprised that *how*- or *why*-questions can give rise to such a disagreement, given the uncertainty about their answer sets that we have pointed out in the beginning. To elaborate, while we have said that the domains of *how*- and *why*-phrases consists of modes and reasons, respectively, there is uncertainty about the nature and individuation of modes and reasons – more uncertainty, we suggest, than about the nature and individuation of individuals or even degrees. It is correspondingly unclear what sorts of properties the nuclei of such questions might denote, also in view of the fact that on the surface they appear to simply express propositions, such as the proposition that Alice taught Max French. It is not obvious, therefore, how to determine the precise membership of these questions' answer sets, hence how to assess the semantic relations that might hold between their members.

In this paper, we will deploy a novel diagnostic for probing the logical makeup of *how*- and *why*-questions, involving the modification of *wh*-phrases with additive *else* (Romero 1998, Isac & Reiss 2004, Harris 2014, Schwarz in press). For both *how*- and *why*-questions, the application of this diagnostic leads us to a finding that may at first seem unremarkable, viz. that depending on the question nucleus' content, Hamblin answers may or may not be pairwise incompatible. However, we will see that the particulars of the data pattern that emerges are surprising, leading one to wonder how to predict from the nucleus' content whether or not a question's Hamblin answers are pairwise incompatible, and, relatedly, how the newly discovered logical typology

of *how-* and *why-*questions might relate to grammatical or notional typologies that have been proposed in previous literature (e.g., Higginbotham 1993, Oshima 2007, Sæbø 2016).

We begin in section 2 by reviewing the disagreement between Oshima (2007) and Abrusán (2011) about *how-*questions. We will conclude that the evidence appealed to in these works, which refers to linguistic responses to questions, is not a reliable diagnostic for the logical makeup of these questions. Section 3 introduces the *wh else-*diagnostic, which we deem more dependable, and applies it to *how-* and *why-*questions, detecting a curious division with regard to the logical makeup of these questions. Section 4 catalogues conceivable sources of answer incompatibility in *how-* and *why-*questions, and it offers very brief and preliminary remarks about what might regulate the membership in the logical typology that we detected. Section 5 concludes.

2 Evidence from linguistic responses?

Oshima (2007) proposes an analysis of so-called factive islands that leads him to claim that the Hamblin answers to *how-*questions like (1) are pairwise incompatible. Here we will confine attention to Oshima's claim itself, without reviewing the analysis of factive islands that motivates it.² Also, while Oshima (2007) proposes that *why-*questions, too, have pairwise incompatible Hamblin answers, we will set *why-*questions aside until section 3.

(1) How did Alice teach Max French?

Oshima recognizes that his claim about *how-*questions is subject to a seemingly obvious objection, based on judgments about possible linguistic responses. Oshima reports that the question in (1) could receive each of the responses in (2) and that these responses are all judged to be compatible with each other, as it is intuitively possible for each of them to be true. Therefore, if each of those responses expressed a Hamblin answer to (1), one would have to conclude that the Hamblin answers to (1) are not in fact pairwise incompatible.

- (2) Alice taught Max French . . .
- a. effectively
 - b. with emphasis on pronunciation
 - c. by private lessons
 - d. based on a contract through a major language school

² We review and defend Oshima's (2007) analysis of factive islands in Schwarz & Simonenko (to appear).

However, Oshima resists this conclusion, viz. by proposing that the different responses in (2) are actually answers to (1) under different interpretations. He proposes that the set of possible modes (i.e., the possible members of the domain of *how*) is subject to a natural partition into non-overlapping dimensions, and that in any given context of use, the domain of *how* comprises only the modes in a particular dimension. Specifically, Oshima suggests that the modes in (2) are members of the respective dimensions sketched in (3).

- (3)
- a. effectively, ineffectively
 - b. with emphasis on pronunciation, listening comprehension, writing skills, ...
 - c. by private lessons, by group lessons, in a large classroom setting, ...
 - d. based on a contract through a major language school, through a private contract, on a volunteer basis, ...

Oshima further proposes that any two modes in the same dimension are mutually exclusive, in the sense that they give rise to incompatible Hamblin answers. If so, then the Hamblin answers to a *how*-question, or rather, to its interpretation in any given context of use, are after all pairwise incompatible.

Yet Abrusán (2011) argues that the evidence from possible responses to *how*-questions is ultimately at odds with Oshima's proposal. To make this point, Abrusán reports that (4), too, is a felicitous response to (1).³

- (4) by private lessons and with emphasis on pronunciation and spelling

Abrusán takes (4) to pick out three modes in the domain of *how* in (1), expressed by *by private lessons*, *with emphasis on pronunciation*, and *(with emphasis on) spelling*, each of which determines a Hamblin answer to (1). With reference to (3), Abrusán accordingly argues that the felicity of (4) shows that *how*-questions allow for mutually compatible Hamblin answers, and more specifically, that Oshima is mistaken in the following two respects. First, the domain of *how* may contain pairs of modes from different dimensions (e.g., the modes expressed by *by private lessons* and *with emphasis on pronunciation*), and the Hamblin answers based on such a pair of modes can be compatible with each other. Second, even Hamblin answers based on modes from the same dimension can give rise to compatible Hamblin answers (e.g., the modes expressed by *with emphasis on spelling* and *(with emphasis on) pronunciation*).

³ With reference to (1) and (4), Abrusán's (2011: 269) states: "Thus not only can several dimensions of manners be salient in a given context, but also within one dimension several modifiers may be truthfully applied to a given event, as long as these do not exclude each other." In the main text, we spell out this objection, or our interpretation of it, in a bit more detail.

However, [Abrusán](#)'s argument rests on a premise that we think is worth questioning, viz. the assumption that (4) makes reference to more than one mode in the domain of *how* and hence determines more than one Hamblin answer to (1) in the same interpretation. It seems likely that the individuation of modes is context dependent, rather than fixed by convention. If so, it seems conceivable that in a reply to (1), *with emphasis on pronunciation and spelling* can express a single mode, determining a single Hamblin answer to (1). Moreover, under [Abrusán](#)'s assumption that the partition of modes into dimensions of the sort posited by [Oshima \(2007\)](#) does not in fact constrain the possible domains of *how*, it is even conceivable that (4) as a whole refers to a single mode, determining a single Hamblin answer. If so, then the felicity of (4) is after all not a threat to [Oshima](#)'s hypothesis that Hamblin answers to *how*-questions are pairwise incompatible.

This analysis of (4) as a response to (1) is furthermore amenable to a modification that still avoids [Abrusán](#)'s objection and that almost achieves full compatibility with the particulars of [Oshima](#)'s proposal. [Sæbø \(2016\)](#) argues at length that a *how*-question can be grammatically ambiguous between a question about manners, which are expressed by adverbials like *slowly*, and a question about methods, which are expressed by *by*-phrases like *by pushing hard*. Yet a conjunction like *slowly and by pushing hard* is surely a felicitous response to a question like, say, *How did she open the door?*. If [Sæbø](#) is correct, the felicity of such a response indicates that, surprisingly, the conjuncts of a conjunctive response can address the same question in grammatically different readings. This leads us to expect that more generally, the conjuncts of a linguistic response to a *how*-question can address the question under different interpretations, that is, under different settings of the domain of *how*. If so, then even if modes are partitioned into dimensions like those sketched in (3), the response in (4) is compatible with [Oshima](#)'s hypothesis that the domain of a *how*-question in any given interpretation is limited to modes from a particular dimension, since it is possible for *by private lessons* and *with emphasis on pronunciation and spelling* (which are assumed to belong to different dimensions) to address the question in (1) under different interpretations. Still assuming that *with emphasis on pronunciation and spelling* can pick out a single mode, under this analysis, too, the felicity of (4) is consistent with the proposal that the Hamblin answers to a *how*-question, under any fixed reading or interpretation, are pairwise incompatible.

If we are correct, then, [Abrusán](#)'s argument against [Oshima](#)'s hypothesis, which makes reference to possible linguistic responses to a question, remains inconclusive. We will in the following propose a diagnostic for the logical makeup of wh-questions that does not make reference to linguistic responses, and hence does not rest on assumptions about the mapping from such responses to Hamblin answers. The diagnostic only appeals to judgments about wh-questions themselves, viz. questions

whose *wh*-phrase is modified by additive *else*. We will apply this diagnostic to both *how*- and *why*-questions.

3 *Wh else* and pairwise incompatibility

The meaning of the *who else*-question in (5) is intuited to differ in two ways from the meaning of its counterpart without *else*, that is, the question *Who attended?* (Romero 1998, Isac & Reiss 2004, Harris 2014, Schwarz in press).

(5) Who else attended?

First, *else* is understood to contribute the additive presupposition that a given salient individual attended. We will refer to this salient individual as the *additive referent*. Second, *else* is understood to subtract the additive referent from the *wh*-phrase's domain, so that the Hamblin answers to (5) do not include propositions about that referent.

So *else* triggers a presupposition that ascribes the nucleus property to the additive referent and it also removes Hamblin answers about that referent from the question meaning. This characterization of the contribution of *else* leads one to correctly expect the intuited infelicity of (6).

(6) #Who else ate the most apples?

This question is predicted to presuppose that the additive referent ate the most apples. As a *wh*-question, (6) is moreover expected to carry another presupposition, viz. the existence presupposition that one of its Hamblin answers is true (e.g., Dayal 1996). Given that *else* removes the Hamblin answer about the additive referent from the question meaning, the expected existence presupposition of (6) is the proposition that someone other than the additive referent ate the most apples. Since it is not possible for more than one individual to be the one who ate the most apples, the existence presupposition contradicts the additive presupposition, and we propose that this contradiction is to be credited for the perceived infelicity of (6).

The contradiction between the presuppositions of (6) just identified follows from the pairwise incompatibility of the Hamblin answers to the counterpart of (6) without *else*, that is, the question *Who ate the most apples?*. Pairs of *who else*-questions and the corresponding bare *who*-questions that transparently have the same profile are easy to multiply, as illustrated by *Who (#else) won this race?*, *Who (#else) killed that spy?*, or *Where (#else) was Bach born?*. Extrapolating from such cases, we suggest that the infelicity of a *wh else*-question can be used to diagnose the pairwise incompatibility of the Hamblin answers to the corresponding bare *wh*-question. It is this diagnostic that we will now apply to *how*- and *why*-questions.

Beginning with *how*-questions, we take the infelicity of the question in (7) to demonstrate that the Hamblin answers to the bare *how*-question *How did he open that coconut?* are pairwise incompatible.

(7) #How else did he open that coconut?

In this case, the evidence from *wh else* is in conflict with the evidence from linguistic responses under Abrusán's (2011) interpretation, discussed in section 2. Example (7) is judged infelicitous notwithstanding the fact that *How did he open that coconut?* can receive felicitous responses like, say, *very carefully, by first drilling a small hole and then cracking it open using a chisel and a mallet*. We take this to confirm the doubts we expressed in section 2 about the reliability of linguistic responses as evidence about a question's semantic content.

To corroborate our assumption that the infelicity of (7) stems from the pairwise incompatibility of Hamblin answers, we point out the felicity of the *how else*-question in (8).

(8) How else could he have opened that coconut?

What (8) shows is that the infelicity attested in (7) can be obviated by the addition of the possibility modal *could* in the question nucleus. Under our analysis of (7), this obviation effect does not surprise us. After all, even if there is only one mode in which he actually opened that coconut, there can be many possible modes in which he *could* have opened it. Hence we might expect that the Hamblin answer to the bare *how*-question *How could he have opened that coconut?* need not be pairwise incompatible.⁴ This interpretation of the contrast between (7) and (8) is further supported by the observation that it is parallel to contrasts found with *who else*-questions. As the felicity of (9) shows, the infelicity of (6), too, can be obviated by the addition of a possibility modal in the question nucleus. In this case, the reason for the obviation effect transparently consists in the fact that more than one person *could* be the one who ate the most apples, so that the Hamblin answers to the bare *who*-question *Who could have eaten the most apples?* need not be pairwise incompatible.

(9) Who else could have eaten the most apples?

Our interpretation of the contrast between (7) and (8) leads us to expect that possibility modals are not alone in their ability to obviate the infelicity that *else* can cause in *how else*-questions. That expectation is correct as well, as illustrated by the

⁴ In terms introduced in section 4 below, the obviation effect shows that the relevant existential operator can take scope over the exhaustification that in the absence of obviation is responsible for the pairwise incompatibility. See section 4 (including footnote 6) for discussion.

felicity of (10), where an existential bare plural replaces the referential subject in (7) (and the anaphoric possessive determiner *their* replaces the demonstrative *that*, so as to distribute contestants over different coconuts).

(10) How else did contestants open their coconut?

Even if for any given person, there is only one mode in which they opened their coconut, there may be many modes such that there is some contestant who opened their coconut in that way. If so, the bare *how*-question *How did contestants open their coconut?* will have many true Hamblin answers. The Hamblin answers to this question are then not pairwise incompatible, correctly allowing for the felicity of (10).

Apart from cases with existential obviation such as (9) and (10), are there other types of *how*-questions where the *wh else*-diagnostic reveals the compatibility of Hamblin answers? We will not attempt an exhaustive or even systematic investigation of this issue, but content ourselves here with identifying one type of *how*-question where the addition of *else* seems generally felicitous, even in the absence of an obviating existential operator. These are certain *how*-questions where *how* stands in for an adjective. The examples in (11), where *how* stands in for the adjectival complement of *feel*, *look*, or *sound*, are cases in point.

(11) a. How else does this make you feel right now?
 b. How else does it look?
 c. How else is it required to sound?

The perceived felicity of these questions shows that the Hamblin answer to the bare *how*-questions *How does this make you feel right now?*, *How does it look?*, and *How is it required to sound?* need not be pairwise incompatible.

We now turn to *why*-questions, which we will see give rise to a similar pattern as *how*-questions. To begin, the *why else*-question in (12) is judged infelicitous, which we interpret as showing that the Hamblin answers to the bare *why*-question *Why did your light go out at midnight?* are pairwise incompatible.

(12) #Why else did your light go out at midnight?

Once again, this result is in conflict with a naïve interpretation of evidence from linguistic responses. We take it that *Why did your light go out at midnight?* allows for a felicitous response like, say, *Because I set the timer when we left and because I forgot to reset it when we got home.* This response, especially in view of the two featured occurrences of *because*, may appear to specify two reasons, and hence determine two different Hamblin answers to the question. However, the data point in (12) leads us to reject that interpretation. It leads us to propose instead

that, despite the two occurrences of *because*, this response at best specifies a single reason, determining a single Hamblin answer.

Once again, infelicity can be obviated by the addition of an existential operator. For example, (13) is felicitous in virtue of the addition of the possibility modal *could*. This is again unsurprising, since even if there is a unique actual reason for your light going out at midnight, there can be many things that *could* be the reason for your light going out at midnight. Given the felicity of (13), we conclude that the bare *why*-question *Why could your light have gone out at midnight?* allows for multiple true Hamblin answers.⁵

(13) Why else could your light have gone out at midnight?

Moreover, just as we saw for *how else*-questions, we can find *why else*-questions that are felicitous even in the absence of an existential operator that obviates pairwise incompatibility. The examples in (14) are of this type.

- (14) a. Why else are you angry?
b. Why else do you like this restaurant?
c. Why else did you decide to resign?

Under our interpretation, the felicity of these examples shows that the bare *why*-questions *Why are you angry?*, *Why else do you like this restaurant?*, *Why else did you decide to resign?* do not have mutually incompatible Hamblin answers.

4 Where does the (in)compatibility come from?

The *wh else*-data presented in section 3, under the interpretation that we have proposed, raise the following two questions. First, in cases of *how*- and *why*-questions where Hamblin answers are incompatible, what is the source of this incompatibility? Second, what separates *how*- and *why*-questions where the incompatibility is attested from *how*- and *why*-questions where no incompatibility is observed?

Here we will merely offer some very preliminary remarks about these issues, leaving a more thorough investigation to future work. To begin, with regard to the source of the incompatibility of Hamblin answers, we suggest that two types

⁵ Unger (1977) argued for the “uniqueness of causation”, based on data similar in nature to *wh else*-questions like (12). Unger reported, for example, that *Bill’s sneezing caused Betty to catch a cold for the second time, and so did something else* is inconsistent, viz. on the grounds of portraying two different events as the cause of Betty’s catching a cold for the second time. In Unger’s example, the modifier *for the second time* is meant to ensure that the two conjuncts refer to the same event of Betty catching a cold. In parallel to the existential obviation observed in (13), omitting this modifier expectedly renders the example consistent, as it then ceases to identify two different causes of the same event.

of approaches should be given due consideration, which we label *domain based* and *exhaustivity based*. We will briefly outline these approaches, focusing on *how*-questions in our illustrations.

The domain based approach is the one envisioned in Oshima (2007). It assumes that pairwise incompatibility in the relevant questions is guaranteed by a condition on the membership of the *wh*-phrase's domain. As reported in section 2, Oshima proposes that the modes in *how*'s domain must belong to the same dimension, and, furthermore, that any two modes in the same dimension must be mutually exclusive in the sense of giving rise to incompatible Hamblin answers.

In contrast, the *exhaustification based* approach equates the source of pairwise incompatibility in certain *how*- and *why*-questions with the source of the familiar uniqueness presupposition carried by singular *which*-questions (Higginbotham & May 1981). To illustrate, the question *Which student attended?* is judged to presuppose that only one student attended. On one possible (and prominent) analysis of this effect, due to Dayal (1996), exhaustification is *global*: questions in general carry a certain presupposition, a presupposition that in the case of singular *which*-questions entails that at most one of the Hamblin answers is true. This presupposition does not, however, alter the semantic content of the answers themselves. So, even though *Which student attended?* presupposes that only one student attended, any answer determined by the semantics of the question still conveys nothing more than that *x* attended, for some student *x*. On an alternative account, recently advanced in Uegaki (2018), exhaustification is *pointwise*: *Which student attended?* presupposes that only one student attended in virtue of each answer carrying that presupposition. That is, any answer conveys, for some student *x*, that *x* is *the* student who attended. Under the exhaustification based approach, then, *How did he open that coconut?* carries the presupposition that there is only one mode in which he opened the coconut, and this uniqueness presupposition might merely be associated with the question as a whole (global exhaustification), or it might be due to each answer conveying, for some mode *m*, that *m* is *the* mode in which he opened the coconut (pointwise exhaustification). In either case, the answers will be pairwise incompatible, be it merely in conjunction with the question's presupposition (global exhaustification) or in virtue of their own total (presupposed or asserted) semantic contents (pointwise exhaustification).

We will in this paper content ourselves with having catalogued these initially conceivable sources of pairwise incompatibility in the answers to *how*- and *why*-questions, and we will leave it to future work to further develop these options or adjudicate between them.⁶ We now very briefly attend to the second issue

⁶ As a preview, we report that the global version of the exhaustification based approach, at least as developed in Dayal (1996), does not seem to deliver the relevant notion of exhaustivity, as it does not support an explanation for the workings of the *wh else*-diagnostic in *how*- and *why*-questions.

raised above, regarding the contrast between *how*- and *why*-questions where the incompatibility of Hamblin answers is observed and those where it is not. Section 3 already suggested a relevant generalization for *how*-questions, noting that pairwise incompatibility is generally not attested in cases where *how* serves as an adjectival complement. It is natural to try to relate this generalization to the semantics of adjectival complements, including the fact that they describe states. As for *why*-questions, the contrast between (12) and (14) seems to point to the relevance of two types of explananda. The contrast suggests that the reason for a non-mental physical event such as a light going out is unique, while there can be multiple reasons for a mental state or action like being angry, liking something, or making a decision. This typology of explananda might go along with a corresponding typology of reasons, such as a partition of reasons into causes (of non-mental physical events) and non-causal explanations (for mental states or actions).

We will refrain here from more fully investigating the grammatical and notional typologies of *how*- and *why*-questions that might correlate with the logical typology discovered in section 3. We merely note that such an investigation is to be conducted against the background of previous literature where grammatical or notional typologies of *how*-questions have been proposed. One possible typology might be derived by extrapolating from the dimensions of modes that were sketched (with reference to a particular example) in Oshima (2007) and that we presented in section 2. In section 2, we also made reference to Sæbø's (2016) proposal that *how*-questions include grammatically distinct questions about manners and questions about methods. In a similar vein, Higginbotham (1993) proposed (in passing) that *why* "incorporates" either *because* or *in order to*, suggesting that *why*-questions can generally be parsed as questions about two type of reasons, such as causes (with *because*) and goals (with *in order to*).

5 Conclusions

We have introduced *wh else*-phrases as a novel diagnostic for investigating the logical makeup of *wh*-questions, and we have applied this diagnostic to *how*- and *why*-questions. If our interpretation is correct, the *wh else*-data we have presented establish that both *how*- and *why*-questions come in two logical types, viz. those

We take it that global exhaustification correctly allows for the felicity of singular *which*-questions with additive *other*, such as *Which other student attended?* By the same token, it fails to exclude infelicitous *how else*- and *why else*-questions like *#How else did he open that coconut?* or *#Why else did your light go out at midnight?* Moreover, since global exhaustification by design takes scope over any operator within the question nucleus, it does not seem to help us understand the obviation of infelicity by an existential operator, as in *How else could he have opened that coconut?* or *Why else could your light have gone out at midnight?* Spelling out the details of these arguments is among the tasks that we hope to take up in future work.

whose Hamblin answers are pairwise incompatible and those whose Hamblin answers can be compatible with each other. The precise nature of the incompatibility, where observed, and the reasons for the split into two logical types remain to be investigated in detail.

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