Wh-exclamatives and other non-interrogative questions*

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1 Introduction

The interrogative sentence type is usually associated with the canonical function of questioning. However, not all sentences with interrogative form have an interrogative function. For instance, rhetorical questions (RQs) like (1b) do not expect to elicit an answer, and can be used to highlight the point that the addressee would never be allowed to participate in a supermarathon. Echo-questions (1c) clarify the form or content of the prior utterance (Noh, 1998). Tag-questions in (1d) are mainly used to get confirmation rather than for asking in a usual sense. Incredulity questions (1e) convey incredulity or outrage (Cohen, 2008).

(1) a. **Question:** *How healthy are you?*
b. **Rhetorical Question:** You would never be allowed to participate in a supermarathon! *After all, how healthy are you?* (not healthy)
c. **Echo Question:**
A: The organisation of the supermarathon said that I am incredibly healthy.
B: *How healthy are you?*
d. **Tag Question:** *You're healthy, aren't you?*
e. **Incredulity Question:**
A: The organisation of the supermarathon said I am healthy as a horse!
B: *HOW healthy are you?* With your asthma?

Some of the utterances above involve asking together with some other function, others cannot even be used for asking in the ordinary sense because the person using them already knows the answer to the underlying question.

Consider now another type of wh-constructions, namely wh-exclamatives (Es), as in (2), whose discourse function is to express speaker's emotions:

(2) Wow! *How healthy you are!*

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They are similar in form to wh-questions, although they have a different word order from questions. If we assume that a wh-clause underlying an E is a question (as opposed to e.g. (Castroviejo Miró, 2006; Rett, 2008), among others), then, intuitively, Es are used to express speaker's emotions at what would be the answer to the underlying question (d'Avis, 2002; Zanuttini and Portner, 2003). In other words, Es also belong to the kind of wh-constructions whose speaker knows the underlying answer and which, therefore, do not have a function of asking.[1]

In this paper I would like to consider two examples of "non-interrogative" questions, namely RQs and Es. A working definition of RQs is: questions whose answer known to its speaker is used for arguing for some issue.[2] Es are wh-constructions used to express surprise at the answer to the underlying question.

As was mentioned earlier, both Es and RQs do not seek information. There are other points of comparison between the two types of wh-constructions. For example, they are both uttered with a particular intonation different from that of questions. Also, Es and RQs in some sense involve expectations. An E expresses that its speaker is surprised at the apparent answer, i.e. that he did not expect the answer to be as it is. Opposite to this, a RQ uses an obvious answer to illustrate the contextually salient issue. Here, the answer must to be obvious (expected) for the speaker and the hearer. Another important aspect of meaning of both Es and RQs is speaker's evaluation of a person, an object, a situation, etc. In this paper I am going to discuss two more points of comparison between Es and RQs that have to do with answers to underlying questions.

Since both Es and RQs are wh-constructions, it would be desirable to use a denotation of the underlying wh-clause in their semantics. If we do so, where do different discourse functions come from? In this paper I suggest a theory of Es and RQs which uses answers to the underlying wh-clause and which motivates the comparison made between Es and RQs.

In section 2 I discuss points of comparison between Es and RQs in more detail and formulate them as two observations. Section 3 introduces the proposal for Es, which explains the observations. In section 4 I suggest a theory for RQs. However, I will show that this theory predicts only a weak version of one of the observations. Section 5 discusses some formal details of the proposals, in particular concerning question semantics on which the proposals for Es and RQs are based. Finally, in section 6 I mention some points for future research.

[1] Es are very similar in their function to so-called pseudo-questions like (i), which seem to contribute speaker's evaluation rather than ask for information (Nye, 2009):

(i) *How healthy are you!*

I will not further discuss this comparison in the paper. Some details can be found in (Nye, 2009).

[2] Another possibility would be, for example, that RQs are questions that do to expect to elicit an answer (Han, 2002; Sadock, 1971). However, in this case incredulity questions also belong to RQs. Merging the two classes might not be a good idea because they perform very different functions in discourse, incredulity questions being much closer to Es than to RQs.

2 Data and observations

2.1 Examples

In this paper I am going to concentrate on Es and RQs introduced by wh-words "who" and "how". A Dutch example of who-Es I will consider is (3b) and can be used in the scenario (3a).[3] Generally, Es are used to express speaker's surprise. Informally, a person using (3b) in this situation wants to express surprise at who Jan invited, in other words, at the fact that Jan invited some unexpected people, namely Peter. Similar German and Russian examples are in (3c) and (3d). In English who-Es (like (3e)) tend to be unacceptable.

(3) a. The speaker expected Jan to invite Maria and Kees, but not Peter. He learns that Jan invited not only Maria and Kees, but also an unexpected person, namely Peter.
b. *Wie Jan nu weer uitgenodigd heeft!*
Who Jan now again invited has!
c. *Wen Jan eingeladen hat*!
Who Jan has invited!
d. *O, kogo Jan priglasil*!
Oh who Jan invited!
e. **Who Jan invited!*

How-Es express surprise at the degree to which some property holds. An example thereof is in (4b) used in the situation (4a):

(4) a. The speaker knows John's parents, who are of the average height (say, between 1m70 and 1m80). When he meets John, he sees that John is really much taller than one would expect knowing his parents (John's height is 1m90).
b. *How tall John is!*

(4b) expresses that its speaker is surprised that John is tall to the degree 1m90, which is higher than he expected.

(5b) is an example of a who-RQ. The discourse role of a RQ is to highlight what would be the answer to it, which is known to both the speaker and the hearer. In the case of (5b), the answer is that Jan didn't invite anyone.

(5) a. Jan was alone at his birthday.
b. *After all, who did he invite?*[4] (No one!)

When one uses a how-RQ (6b) in the scenario (6a), he highlights that John is 1m50 tall, which is really short for a basketball player, and uses this to support his claim that John

[3]Note that who-Es in Dutch and German are acceptable only when they contain special particles (like "*nu weer*" in (3b)). I will not consider influence of particles on Es in this paper.

[4]I use "*after all*" just to make sure that the utterance under discussion is a RQ, for ordinary questions cannot be preceded by "*after all*".

should be sacked from the team:

(6) a. I think we should sack John from our basketball team.
b. *After all, how tall is he?* He is only 1m50 tall!

As was mentioned before, Es and RQs both have a form similar to interrogative sentences, but their discourse functions are different from that of asking. In particular, both Es and RQs can only be used felicitously when the speaker knows the answer to the underlying question, whereas by using an "ordinary" interrogative sentence the speaker indicates that he does not know the answer, and wishes to know it.

In this section I discuss two more points of comparison between RQs and Es, the first one concerning how-Es and RQs involving a gradable adjective, and the second one who-Es and RQs.

2.2 Observation 1: constraints on degrees

How-Es and RQs containing a gradable predicate impose special conditions on the degree to which the predicate holds. Consider first a how-RQ (6b), which involves a gradable predicate "tall". First of all, this RQ is felicitous when John is short, as in the scenario (6a), which I will call 1m50-scenario. Informally speaking, the speaker uses the RQ to argue that they should sack John from the basketball team because (probably, among other reasons) he is really not tall.

This is not the only situation in which this RQ can occur. The same RQ can be used when John is very tall. Look at the following discourse fragment:

(7) a. We should definitely take John to our basketball team!
b. *After all, how tall is he?* He is 2m30 tall! Of course, we need such a tall basketball player!

Here, the RQ is used to argue in favour of accepting John to the team because he is really tall. Notice now that the same RQ is infelicitous (or at least much less natural) in the situation when John has average height, as in the scenario (8a):

(8) a. We're looking for average people to take a picture of the crowd. We need people between 1m70 and 1m80 tall. So lets take John!
b. #*After all, how tall is he?* (when John is 1m75)

To generalise, I make the following observation about contexts in which how-RQs occur:

Observation 1 for RQs: For a how-RQ containing a gradable predicate the degree to which the predicate holds must be located at an extreme end of the scale (be extremely low or extremely high).

A similar observation was made in (Rohde, 2006). In a corpus study she observed that RQs with non-extreme answers were notably absent. However, as Rohde noticed as well, the

conclusion that how-RQs with non-extreme degrees do not exist is difficult to make. Since how-RQs can involve not just scales based on the adjective present in the RQ, but scales coming from the context as well, if we find a how-RQ ostensibly expressing an average degree on some scale, there might always be a different scale where the answer is located at the extreme end.

Turning to the case of how-Es involving a gradable predicate, there are conditions on degree the context of Es must satisfy. In the 1m90-scenario (4a) the E (4b) expresses speaker's surprise that John is very tall. Consider now the following scenario, when John is very short, where the same E is infelicitous:

(9) a. The speaker knows John's parents, who are extremely short (their height is 1m40). When he meets John, he sees that John is much taller than one would expect knowing his parents. His height is 1m50, which is taller than expected, but is still considered short compared to other people.
b. #*How tall John is!*

In other words, (9b) cannot be felicitously used when John is short, even though the speaker might have expected him to be even shorter. The following example shows that it is also not enough to be "just tall", i.e. to exceed the standard of height just a little bit:

(10) a. The speaker knows John's parents, who are of the average height (say, between 1m70 and 1m75, when the standard for tallness is 1m75). When he meets John, he sees that John is taller than one would expect knowing his "average" parents (John's height is 1m81).
b. #*How tall John is!*

The requirement on degrees seems to be that the degree to which the predicate holds must be *much higher* than the standard. Therefore, the observation about degree requirements on the context for Es is as follows:

Observation 1 for Es: For a felicitous use of a how-E containing a gradable predicate the degree to which the predicate holds must be extremely high.

A number of similar observations were made in different works on semantics of Es. For example, (Grimshaw, 1979) analyses Es as being inherently factive, which means that "*How tall John is!*" presupposes that John is tall (taller than the standard). Also, (Rett, 2008) notices that the degree to which the predicate holds, must be higher than the contextual standard. This is weaker than my Observation 1 for Es since the latter requires the degree to be *extreme* (much higher than the standard) and not just to exceed the standard. The difference is visible in contexts like (10a). The E is not very good in this scenario, intuitively because John is not really much taller than the standard, just taller than the speaker expected. Similarly, when one utters an E "*How beautiful Mary is!*", it is not enough that he considers Mary ordinarily beautiful, but rather exceptionally beautiful.

Similarly to my Observation 1, (Zanuttini and Portner, 2003) observe that Es introduce a conventional scalar implicature that the proposition they denote lies at the extreme end of some contextually given scale. They derive this property from the combination of widening

the domain of quantification for the wh-word and factivity.

However, Castroviejo Miró provides a different (opposite) observation, namely that the speaker must consider the degree to which the predicate holds higher than expected (Castroviejo Miró, 2006, 2008). In other words, it is not necessary that the degree is much higher than the standard of comparison, or even just higher. The difference between this and my observation is visible from comparing contexts (4a) and (9a). For (9a), Castroviejo Miró's requirement holds (John is higher than expected), but my Observation 1 does not (John is not extremely tall).

To conclude, similar contextual requirements on degree were suggested separately for Es and RQs. But, as far as I know, how-RQs and Es were never compared with respect to the requirement on degree. In this paper I use this comparison as a motivation for similar semantic/pragmatic analysis of how-RQs and Es.

2.3 Observation 2: instantiation of the wh-variable

Observation 2 describes behaviour of RQs and Es in a situation when the wh-variable is not instantiated. I will consider who-RQs and Es for illustration. Starting with RQs, one of the most natural uses of RQs is precisely in this kind of situation. For example, when one utters a RQ "*What has John ever done for me?*", he actually asserts that John has never done anything for him. Also, it is perfectly fine to use a who-RQ (5b) when Jan did not invite anybody, as in (5a). Therefore, Observation 2 for RQs is:

Observation 2 for RQs: RQs are felicitous in contexts when the wh-variable is not instantiated.

It has been noticed in many works (Sadock, 1971, 1974; Han, 2002) that RQs can be used in this kind of "negative" scenarios (and only the "negative" scenarios were considered!). The use of RQs having non-negative answers were left for footnotes. As proposed in (Han, 2002), RQs perform assertions of the opposite polarity. For (5b) it means asserting that Jan didn't invite anyone. However, this kind of approach gives restricted predictions when a RQ has a singleton positive answer (see e.g. example (26b) below). Therefore, I am going to suggest an alternative to it.

Turning to Es, there is a sound observation that (11b) is infelicitous when no one is invited:

(11) a. (when Jan didn't invite anybody)
b. #*Wie Jan nu weer uitgenodigd heeft!*
Who Jan now again invited has!

Observation 2 for Es: Es require the wh-variable to be instantiated.

Infelicity of who-Es in this kind of situations was already noticed in (d'Avis, 2002), but only for the case of embedded Es.

In sum, in this section I described the two observations which serve as points of comparison between Es and RQs. In the next two sections I will describe my proposal for Es and RQs

and how to derive the observations from it.

3 Proposal for Es

In this section I present a proposal for denotation and use of Es, and show how the two observations follow from it. My reasoning is similar to theories like (d'Avis, 2002; Zanuttini and Portner, 2003; Abels, 2004). This type of theories gives a question denotation to Es and does not restrict the kind of meanings Es can have. In other words, Es can express surprise at different things: people, objects, places, times, situations, etc., since the range of wh-words that can introduce Es is not restricted.

There are also other type of theories, claiming that meanings of Es must always involve degrees (Castroviejo Miró, 2006; Rett, 2008). The role of Es is therefore to express that the speaker is surprised that some gradable property provided by the context holds to a high degree. This kind of theories is too restricted for my purposes because they predict that there are no Es introduced by non-degree wh-words like "who", "what", "where", "when", etc. since they would express surprise at something different from degrees. As the ungrammaticality of (3e), among other similar examples, shows, these theories give good predictions for Es in English. However, they are too restricted for cross-linguistic purposes. In particular, they do not allow for who-Es like (3b), (3c) and (3d) in Dutch, German, and Russian.

I will follow the first kind of approaches, in particular that of (d'Avis, 2002), which I will describe in the following section. The idea is that the wh-clause underlying an E has a question denotation. Further, two notions of answers to a question are defined which are then used for formulating pragmatic conditions describing the use of Es. However, as will be shown later, d'Avis' proposal in its original form cannot handle some Es and does not explain Observation 1. I suggest how to improve d'Avis' line of reasoning, and show how to derive the observations from my proposal.

3.1 (d'Avis, 2002)

Consider a Dutch who-E in (12b) used in the scenario (12a):

(12) a. The speaker expected Jan to invite Marie and Kees to his birthday party, but not Peter because he knows that Jan can't stand Peter. Later he learnt that Jan invited not only Maria and Kees, but also Peter, an unexpected person.

b. *Wie Jan nu weer uitgenodigd heeft!*
Who Jan now again invited has!

As mentioned before, (12b) is used to express surprise that Jan invited an unexpected person. For d'Avis, an E has the denotation of the underlying question. He uses the denotation from (Karttunen, 1977), i.e. the set of propositions which are true answers to the question. For (12b), the true answers to the questions "Who did Jan invite?" are the following propositions, informally expressed:

(13) $[\![who\ Jan\ invited]\!]$ = {Jan invited Marie, Jan invited Kees, Jan invited Peter, Jan invited Marie and Kees, Jan invited Marie and Peter, Jan invited Kees and Peter, Jan invited Marie, Kees, and Peter}

Karttunen's denotation of a wh-clause gives rise to two notions of answers first suggested in (Heim, 1994): the **true answer**, $answer_1$, and the **true exhaustive answer**, $answer_2$. They are defined as in follows:

(14) a. $answer_1$ is the weakly exhaustive answer, i.e. the conjunction of all true answers to a wh-question
b. in the world w: $answer_1(w) = \bigcap [\![wh - clause]\!](w) = \bigcap \{p \mid p \in [\![wh - clause]\!](w)\}$
c. $answer_2$ is the strongly exhaustive answer, i.e. the set of worlds where $answer_1$ is the same as in the actual world
d. in the world w: $answer_2(w) = \{w' \mid answer_1(w') = answer_1(w)\}$

$Answer_1$ is a conjunction of all propositions in the Karttunen's denotation of the wh-clause. In the scenario above, $answer_1$ expresses the proposition that Jan invited Marie, Kees, and Peter, and probably someone else. That is, it contains all worlds where at least these three people are invited. $Answer_2$ is the collection of worlds where $answer_1$ is the same as in the actual world, i.e. that Jan invited the three people, Marie, Kees, and Peter, and probably someone else. Therefore, $answer_2$ is the proposition that these three people were invited, and *only* they were. Indeed, worlds where, for example, also Sue is invited, are not in $answer_2$ because there $answer_1$ is the proposition that Marie, Kees, Peter, and also Sue are invited, which is different from $answer_1$ in the actual world. The difference between the two answers is that, for example, a world w_0, where Marie, Kees, Peter, and also Paul came, belongs to $answer_1$, but not to $answer_2$. Expressed formally, the answer concepts for (12b) are:

(15) a. $answer_1(w) = [\![invited]\!](m)(j) \ \wedge \ [\![invited]\!](k)(j) \ \wedge \ [\![invited]\!](p)(j)$
(Jan invited Marie, Kees, and Peter, and possibly someone else)
b. $answer_2(w) = [\![invited]\!](m)(j) \ \wedge \ [\![invited]\!](k)(j) \ \wedge \ [\![invited]\!](p)(j)$
$\wedge \ \forall x \notin \{m, k, p\} \ \neg [\![invited]\!](x)(j)$
(Jan invited *only* Marie, Kees, and Peter, and no one else)

d'Avis' theory of Es can be reformulated in terms of speech act theory, where the exclamative intonation is suggested to have a meaningful effect. The semantic content of an E is uttered with a special exclamative illocutionary force. Felicity conditions on this exclamative illocutionary force are formulated using the two answer concepts. The three pragmatic conditions suggested by d'Avis are as in (16):

(16) a. **Condition 1:** The speaker knows the true exhaustive answer to the question
b. **Condition 2:** The speaker is surprised at the true answer
c. **Condition 3:** The wh-variable is instantiated

First of all, let us check that these conditions hold for the scenario (12a). Indeed, the speaker knows the true exhaustive answer to the question, i.e. that Jan invited Maria, Kees and

Peter, and only those three. The speaker is surprised at the true answer (that Jan invited Maria, Kees and Peter) because he expected only Maria and Kees to be invited. Finally, the wh-variable is instantiated since someone is invited.

Notice that the distinction between the true answer and the true exhaustive answer is crucial for Es. It is not enough to have just the true exhaustive answer, and to impose a condition that the speaker is surprised at it. Otherwise the E (12b) is predicted to be good when the speaker expected Jan to invite Marie, Kees, and Peter, but only Marie and Kees were invited. This is so because the speaker is surprised at the true exhaustive answer (Jan invited only Marie and Kees) since he expected more people, namely also Peter, to be invited. This prediction is however undesirable. In d'Avis' theory, which uses the two answers, the condition 2 does not hold in this situation. Indeed, the speaker is not surprised that Marie, Kees *and probably someone else* were invited since he expected so. This gives rise to infelicity.

Observation 2 for Es follows straightforwardly from the condition 3. Indeed, in the scenario (17a):

(17) a. The speaker expected Jan to invite Marie to his party. However, Jan didn't invite anyone.
b. *#Wie Jan nu weer uitgenodigd heeft!*
Who Jan now again invited has!

the condition 3 is violated because the wh-variable is not instantiated. In other words, one cannot use (17b) when he knows that Jan didn't invite anyone, as in (17a).[5] In this case, a declarative E (18) would express surprise that no one is invited, contrary to the speaker's expectations:

(18) *Jan didn't invite anyone!*

3.2 Discussion of d'Avis' theory

Up to now, I discussed d'Avis' theory on the examples of who-Es. Let us see what it would predict for how-Es. It predicts felicity of the how-E (4b) in the scenario (4a). The true answer and the true exhaustive answer to the question "How tall is John?" coincide and constitute a proposition: "John is 1m90 tall". The speaker finds the true answer surprising because he expected John to be smaller.

There are however a couple of problems with d'Avis' proposal. First, literally taken, it does not describe the behaviour of how-Es correctly. Consider the same how-E (19b), which is not felicitous in the scenario (19a):

(19) a. The speaker knows John's parents, who are really tall (2m). When he meets John, he sees that John is "only" 1m80 tall, which means that he is much shorter

[5] In fact, the observation is directly encoded in the felicity conditions, which is not very elegant. This is so also in my theory described in section 3.3. However, see (Abels, 2004) for an attempt to truly *derive* this observation.

than one would expect knowing his parents, although still tall compared to other people.

b. *#How tall John is!*

Here, John's height is different from what the speaker expected, namely, John is shorter than the speaker thought he would be. In the scenario (19a) the true answer and the true exhaustive answer are the same, namely the proposition "John is 1m80 tall". Furthermore, all the pragmatic conditions from (16) are satisfied. In particular, the condition 2 says that the true answer must be surprising for the speaker, which is the case in (19a) because the speaker expected John to be of a different height, namely taller than he actually is. However, as infelicity of (19b) shows, this is an undesirable prediction. In other words, (19b) can only be used when the speaker expected John to be *shorter* than he actually is.

Another problem for d'Avis' proposal is that it does not explain Observation 1. In the following scenario (20a), which is repeated from (9a), John is taller than the speaker expected, but still short compared to other people:

(20) a. The speaker knows John's parents, who are extremely short (their height is 1m40). When he meets John, he sees that John is much taller than one would expect knowing his parents. His height is 1m50, which is taller than expected, but is still considered short.

b. *#How tall John is!*

The use of (20b) is infelicitous, which is captured by Observation 1. However, all the pragmatic conditions suggested by d'Avis are satisfied (just substitute the height 1m90 for 1m50 in the 1m90-scenario (4a)). What d'Avis' theory lacks here is that John must be objectively considered "surprisingly tall" when compared to other people.

I will show how to overcome these difficulties in the next section.

3.3 Proposal for Es

A major assumption needs to be added to the reasoning of d'Avis, namely that gradable predicates are monotone (see, among others, (Cresswell, 1976; von Stechow, 1984; Heim, 2000; Nouwen, 2010)). When applied to "tall", this means that if John is tall to a certain degree, he is also tall to all smaller degrees. For instance, the fact that John is tall to the degree 1m90 entails that John is tall to the degrees 1m80, 1m70, etc. Monotonicity of a gradable predicate "*tall*" of the type $\langle e, \langle d, t\rangle\rangle$ is formally defined in (21):

(21) $\forall d, d'\ (d' \leq d\ \&\ [\![tall]\!](j)(d)\ \Rightarrow\ [\![tall]\!](j)(d'))$

Consider the scenario (4a) repeated here as (22a):

(22) a. The speaker knows John's parents, who are of the average height (say, between 1m70 and 1m80). When he meets John, he sees that John is really much taller than one would expect knowing his parents (John's height is 1m90).

b. *How tall John is!*

Notice that being tall to the degree e.g. 1m90 does not mean having *exactly* the height 1m90, but having the height *at least* 1m90. This is because, thanks to monotonicity, the proposition "John is tall to the degree 1m90" is also true if John is 1m95, 2m, 2m05, etc. tall, in other words, when he is *at least* 1m90 tall.

Assuming monotonicity of gradable predicates allows to correctly apply d'Avis' proposal to how-Es. Consider first the scenario from (22a) for the E (22b). d'Avis' theory already gave correct predictions for this use of the E, and they stay in my theory. Because of the monotonicity of "tall", the denotation of the wh-clause underlying (22b) includes propositions like "John is tall to the degree 1m90", "John is tall to the degree 1m80", "John is tall to the degree 1m70", ... "John is tall to the degree 1cm". The true answer is the conjunction of all true answers to the question, so it is the proposition "John is tall to the degree 1m90", because all the other propositions in the denotation of the wh-clause follow from it (thanks to monotonicity). That is to say, the true answer is the proposition "John is *at least* 1m90 tall". The true exhaustive answer is defined as the set of worlds where the true answer is the same as in the actual world, i.e. "John is *at least* 1m90 tall". Worlds where John is less than 1m90 tall (e.g. 1m50) are not included there because the true answer in these worlds is "John is at least 1m50 tall", and it includes worlds where John is 1m50 tall. These worlds are not in the true exhaustive answer for (22b). The worlds where John is more than 1m90 tall (e.g. 2m) are not a part of the true exhaustive answer either, for the analogous reason. Therefore, the true exhaustive answer only includes worlds where John is *exactly* 1m90 tall.

To summarise, the denotation of the wh-clause and the two answer concepts for (22b) in (22a) are in (23):

(23) a. $[\![wh - clause]\!]$ = {John is tall to the degree 1m90, John is tall to the degree 1m80, John is tall to the degree 1m70...}
b. **the true answer**: John is *at least* 1m90 tall
c. **the true exhaustive answer**: John is *exactly* 1m90 tall

I impose the three felicity conditions suggested by d'Avis. The proposal predicts correctly that (22b) is felicitous in the scenario (22a) because all three pragmatic conditions hold. First, the speaker knows the true exhaustive answer to the question (that John is 1m90 tall). Second, the speaker is surprised at the true answer (that John is at least 1m90 tall) because he expected John to have "normal" height, as his parents, i.e. to be shorter than 1m90. Finally, the wh-variable is instantiated (John has some height). Notice in passing that the condition 3 always holds for how-Es since there is a degree to which the gradable predicate holds. In other words, Observation 2 for how-Es follows automatically.

The example just discussed was already predicted by d'Avis' original theory. Now I will show that adding monotonicity of gradable predicates helps predicting infelicity of a how-E when the speaker expected a bigger height (as in the example (19a), which was problematic for d'Avis). When the speaker expected John to be *taller* than he actually is, the condition 2 is not satisfied. Indeed, the true answer to the underlying question is "John is 1m80 tall, and probably taller", and this is not surprising for the speaker for he expected John to be much taller than 1m80, as his parents are 2m tall.

In the next section I show how assuming monotonicity of gradable adjectives together with semantics of surprise helps deriving Observation 1, which was also one of the problems for the original d'Avis' proposal.

3.4 Deriving Observation 1 for Es

Because of monotonicity of "tall", if a person is tall to some degree, he is also tall to all lower degrees. Therefore, all tall people are tall to high, average and low degrees. All average people are tall to average and low degrees. To give an extreme example, every person is tall to the degree 1cm. This means that many people are tall to average and low degrees, and thus being tall to these degrees is not surprising. In other words, *only being tall to high degrees is surprising.* The pragmatic condition 2 requires the true answer to the underlying question to be surprising. Therefore, the true answer must express that John is tall to a high degree.

Let us compare true answers used for checking the condition 2 in the high (1m90) and low (1m50) degree scenarios, as in (22a) and (20a) respectively:

(24) a. The true answer in the 1m90-scenario: John is 1m90 tall, and perhaps taller
b. The true answer in the 1m50-scenario: John is 1m50 tall, and perhaps taller
c. Condition 2 in 1m90-scenario: it is surprising that John is 1m90 tall, and perhaps taller, because there are not many people tall to the degree 1m90
d. Condition 2 in 1m50-scenario: it is *not* surprising that John is 1m50 tall, and perhaps taller, because there are many people tall to the degree 1m50

The conclusion is that the pragmatic conditions for the use of the E are satisfied in the 1m90-scenario, but not in 1m50-scenario, which predicts the felicity of the how-E in the first, but not in the second case. This is, of course, a desirable prediction. To sum up, if John is tall to a low or average degree of height, as in the scenarios (20a) and (10a), many people are tall to the same degree, so it is not felicitous to use the E. When John is tall to a high degree, it is surprising, which allows to use the E.

Strictly speaking, what is predicted is that for a felicitous use of the how-E John must have a degree of height that not many people have. This is quite a vague description, which corresponds to "*surprising*" being a vague predicate.

Suppose that in the context the speaker is surprised at some event if the probability of this event happening is less than some value α. Look at the figure 1 which shows the probability that some person is tall to the degree x. For simplicity, I assume that this probability distribution is normal. Since all people are tall e.g. to the degree 1cm, this probability is 1. On the other hand, the probability of being tall to a very high degree, like 2m, is much lower, whereas the probability of being tall to the degree 2.5m is almost 0. Therefore, for $\alpha = 0.2$ it is surprising if a person is 1m90 tall or taller, and not surprising if he is less than 1m90 tall. For other gradable predicates the plot of the probability as a function of the predicate holding to a certain degree would look very similar. In other words, for low degrees the probability that the predicate holds is very high, and for high degrees very low. This is thanks to the monotonicity of gradable predicates, which states that if a predicate holds to some degree,

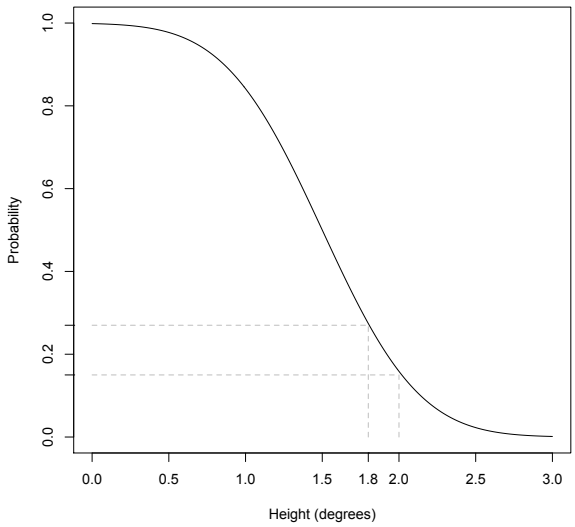


Figure 1: Probability of a certain person being tall to some degree

it also holds to all lower degrees. From the semantics of surprise it follows that α has to be small, which means that "surprising" degrees have to be extreme.

For a felicitous use of the E "*How tall John is!*" it is not enough that John is tall to some degree exceeding the standard on the scale of height just a little, as the scenario (10a) shows. Instead, John must have a degree of height lying at the extremely high end of the scale. As was mentioned, being tall to standard (average) degrees is clearly not surprising, whereas being tall to extremely high degrees is clearly surprising. Therefore, degrees slightly exceeding the standard constitute a borderline case for "surprising". Es, whose discourse function is expressing surprise, are not always good in this kind of situations.

As was mentioned before, an observation similar to Observation 1 was made in (Rett, 2008), namely: the degree in question must be high relative to a contextual standard. I think, on its own, this does not describe a full picture, because of examples like (10a). However, in her analysis of Es Rett suggests that Es are uttered with a special illocutionary force, which requires that there is a degree exceeding the standard such as the speaker is surprised that some contextual property holds to this degree. Notice that the notion of *surprise* is included in Rett's proposal about the exclamative illocutionary force. Therefore, it is possible to derive the correct contextual restriction on degrees within Rett's theory by combining the reasoning above about the semantics of "*surprising*" with Rett's illocutionary force.

To sum up, a how-E containing a gradable adjective expresses surprise at a high degree to which the adjective holds. The same E would not be felicitous when this degree is average or low. In the following section I review the theory for RQs from (Rohde, 2006), formulate my proposal, and show how it is used to derive the observations.

4 Proposal for RQs

One line of approaches associates RQs with assertion of the opposite polarity from what is apparently asked (Borkin, 1971; Sadock, 1971; Krifka, 1995; Banuazizi and Creswell, 1999; Han, 2002; Ladusaw, 2003). They are mainly concerned with explaining NPI licensing in RQs. For illustration, consider (25b), which asserts the negative answer that Jan did not invite anyone:

(25) a. Jan was alone at his birthday.
b. *After all, who did he invite?* (No one!)

This kind of approaches is too restricted for at least two reasons. First, RQs can have different kind of answers: not only negative, but also positive, non-null answers and multiple answers (Rohde, 2006). For example, (26b) has a non-null answer, namely that Jan invited Marie to the movie (as opposed to the negative answer that Jan invited no one):

(26) a. Jan definitely likes Marie!
b. *After all, who did he invite to the movie last week?* (Marie)

RQs viewed as asserting their negative answer would not work for this example. Second, theories like (Han, 2002) did not take into account RQs introduced by the wh-word "*how*", like (6b). One of Han's claims is that in rhetorical wh-Qs the wh-phrase denotes the bottom element of the corresponding algebraic structure. For who-RQs, for example, it would be the empty set. Since "*how*" ranges over degrees on a scale, "*how*" in RQs should denote the bottom element on the scale. In other words, the RQ "*How tall is John?*" is assumed to assert that John is tall to the degree 0, which is wrong. Han's reasoning could be saved if we consider not the scale of degrees of heights, but a scale like the following having "very short" as the bottom element:

(27) ⟨very short, short, averagely tall, tall, very tall⟩

Then the RQ would assert that John is very short, and this is what the RQ seems to express, at least in some scenarios. The problems now are: Why for the case of RQs the "imprecise" scale (27) must be used rather than the scale with degrees of height? And how would Han's approach explain that how-RQs can be used in high degree scenarios like (7a)?

A fundamentally different approach to semantics and pragmatics of RQs is suggested in (Rohde, 2006). She considers RQs as uninformative assertions serving to synchronise beliefs of the speaker and the hearer. I will describe this theory in more detail in the following section and compare it to my own proposal described afterwards.

4.1 (Rohde, 2006)

In Rohde's theory, RQs, as regular questions, have an answer set, but they are *redundant* because they assert information which is already in the common ground. For felicitous use

of RQs, three conditions must be satisfied. I present them informally here, the formalisation can be found on (Rohde, 2006):

(28) a. **Condition 1:** there is an obvious answer in the answer sets of the speaker and the hearer
b. **Condition 2:** the answer is uninformative (the speaker and the hearer know it, and they know that they both know the answer)
c. **Condition 3:** the speaker's and the hearer's answers coincide or are located at the same extreme end of a contextually given scale

The first condition requires that both the speaker and the hearer would not be surprised to learn the answer to the question, in other words, that the answer is predictable and therefore need not even be uttered directly. This is the opposite to what felicitous use of Es require, namely the answer to the underlying question being *unexpected*.

Consider example of a who-RQ (26b) used in the scenario (26a). All three conditions from (28) are satisfied. First, in the situation (26a) at the moment of use of the RQ (26b) it must be evident for both the speaker and the hearer that Jan invited Marie. The second condition requires that RQs do not bring new information for the speaker and the hearer. In (26a) the speaker and the hearer both must know that Jan invited Marie, and also know of each other that the other one knows it. The third condition says in some cases that the answer of the speaker and the answer of the hearer coincide, and in other cases they occupy similarly extreme regions of a relevant scale. In (26b) the first is the case. To illustrate the second, consider consider a how-RQ used in a low degree scenario (6a) repeated as (29a):

(29) a. I think we should sack John from our basketball team.
b. *After all, how tall is he?* (John is 1m50 tall)

If the speaker (correctly) believes that John's height is 1m50, and the hearer (wrongly) thinks that it is 1m51, the answers to the RQ do not coincide. However, what they have in common is that they are both located at the extreme low end of the scale of height. That is to say, the use of (29b) is felicitous because both the speaker and the hearer know that John is a very short basketball player. Notice that because Rohde's Condition 3 encodes extremeness, Observation 1 follows from her theory. RQs with answers located at the midpoint of the scale (non-extreme position) are predicted to always be infelicitous. This prediction is confirmed by her corpus investigations.

Checking the three Rohde's conditions for the RQ (25b) in the scenario when the wh-variable is not instantiated (i.e. when Jan did not invite anyone) predicts its felicity, which explains how Observation 2 follows from Rohde's analysis.

As I showed, Rohde's theory of RQs already explains both observations about RQs. However, there are a number of things that I would like to do in a different way. First, strictly speaking, the theory directly encodes Observation 1 about extreme degrees into one of the felicity conditions. In my theory I would like to have extremeness *derived* from the conditions, as it was the case for Es, when I derived high degrees from the semantics of surprise. Second, Rohde uses the question semantics suggested in (Groenendijk and Stokhof, 1997) and, as

a consequence of this, she means the true exhaustive answer every time she speaks about an answer. This gives an incorrect prediction that how-RQs can be used in precise degree scenarios like the following:

(30) a. I need someone of the height precisely 1m 99cm and 99mm. I think John fits.
b. *#After all, how tall is he?*

Suppose the speaker and the hearer both know that John has this particular height, and the first two Rohde's conditions are satisfied. Condition 3 states that the speaker's and the hearer's answers coincide or are located at the same extreme end of the scale of height. This is true in the context, because the degree 1m 99cm 99mm is obviously very high. Therefore, the use of the how-RQ is predicted to be felicitous, which is not the case.

In the next section I will suggest an alternative theory. I will use both the true and the true exhaustive answers to the question and the notion of arguing for some contextual issue. I will also explain why precise degree scenarios are bad for RQs.

4.2 Proposal for RQs

Consider an example of a who-RQ (26b) having a non-null answer repeated here as (31b):

(31) a. Jan definitely likes Marie!
b. *After all, who did he invite to the movie?* (Marie)

Informally speaking, the RQ here is used to illustrate that Jan indeed likes Marie. In other words, the discourse function of RQs is to argue for the salient issue. This will be reflected in pragmatic conditions I propose for RQs. As in the theory of Es, I suggest that a wh-clause underlying a RQ has a question denotation. As will be shown later, the distinction between the true and the true exhaustive answers is relevant for RQs. The answers for (31b) in the scenario above, expressed informally, are:

(32) a. **the true answer**: Jan invited Marie (and possibly someone else)
b. **the true exhaustive answer**: Jan invited *only* Marie

I propose that for a RQ to be used felicitously, the context must satisfy the following two conditions:

(33) a. **Condition 1:** The speaker and the hearer know the true exhaustive answer to the question
b. **Condition 2:** The speaker uses the true answer or its complement to argue for the salient issue

Condition 1 basically expresses the same as Rohde's conditions 1 and 2, i.e. that the speaker's and the hearer's answers are obvious and uninformative. I do not get into details here about how obviousness and informativity are formalised, and I assume that it is done in the same

way as in (Rohde, 2006). Condition 2 is meant to replace Rohde's Condition 3. Notice that it does not include directly requirement on extreme degrees for how-RQs. Instead, I will show how to *derive* this requirement.

The conditions are satisfied in the scenario (31a) because:

(34) a. The speaker and the hearer know the true exhaustive answer to the question (that Jan invited Marie to the movie)
b. The speaker uses the true answer (Jan invited Marie) to argue for the salient issue (Jan likes Marie)

Notice that I could have required the *true exhaustive* answer to argue for the issue instead of just the true answer. Indeed, "Jan invited Marie, and only her, to the movie" just as well argues that Jan likes Marie. Choosing the true answer for argumentation gives the following prediction: the same RQ (31b) is also felicitous when Jan invited Marie and Piet:

(35) a. Jan definitely likes Marie!
b. *After all, who did he invite to the movie?* (Marie and Piet)

Inviting Marie and Piet entails inviting just Marie. If "Jan invited Marie" is a good argument for the issue "Jan likes Marie", so is "Jan invited Marie and Piet". In other words, inviting an extra person, Piet, is irrelevant for the issue, and does not prevent arguing. However, it needs to be checked if this is a desirable prediction. The use of the true rather than the true exhaustive answer becomes more crucial when a context involves degrees, e.g. for how-RQs. I will come back to this distinction in the next section, when I discuss how-RQs.

The same RQ is felicitous in the scenario when Jan did not invite anyone, which explains Observation 2 for RQs. Indeed, if the wh-word is not instantiated, as in the scenario (25a):

(36) a. The speaker and the hearer know the true exhaustive answer to the question (Jan didn't invite anyone to the party)
b. The speaker uses the true answer (Jan didn't invite anyone to the party) to argue for the salient issue (Jan was alone at the party)

In the next section I explain how Observation 1 is derived from the proposed theory.

4.3 Deriving Observation 1 for RQs

To derive Observation 1, I have to show that how-RQs are felicitous with extremely high and low degrees, but not with average degrees. Let us start with the case of high degrees:

(37) a. We should definitely take John to our basketball team!
b. *After all, how tall is he?* (when John is 2m30 tall)

Analogously to the examples of Es (see, for example, (22) and (23)), the two answers in the scenario (37a) are as follows:

(38) a. **the true answer:** John is *at least* 2m30 tall
b. **the true exhaustive answer:** John is *exactly* 2m30 tall

The pragmatic conditions (33) are satisfied because:

(39) a. The speaker and the hearer know the true exhaustive answer to the question: that John is 2m30 tall
b. The speaker uses the true answer (John is at least 2m30 tall) to argue for the salient issue (John is a very tall basketball player)

Now I will show how to predict infelicity of how-RQs in the average degrees scenario, which is repeated here from (8a):

(40) a. We're looking for average people to take a picture of the crowd. We need people between 1m70 and 1m80 tall. So lets take John!
b. *#After all, how tall is he?* (when John is 1m75)

The answers are as follows:

(41) a. **The true answer:** John is *at least* 1m75 tall
b. **The true exhaustive answer:** John is *exactly* 1m75 tall

The pragmatic condition 2 is not satisfied in the scenario (40a) since the true answer (John is at least 1m75 tall) does not argue for the salient issue (John has a "normal" height, that is between 1m70 and 1m80). This is because the true answer is consistent with John being, for example, 2m tall. And this is definitely not an argument for John having a "normal" height.

Finally, let us turn to the low degrees scenario. Here it will become clear why the *complement* of the true answer has to be included into the condition 2. The scenario from (6a) is repeated in (42a):

(42) a. I think we should sack John from our basketball team.
b. *After all, how tall is he?* (when John is 1m50)

The true answer in this scenario is "John is *at least* 1m50 tall", and the salient issue is "John is very short for a basketball player". The true answer itself cannot argue in favour of the issue for it allows John to be taller than 1m50, for example, 2m tall, which would not be an argument for John's shortness. However, the *complement of the true answer*, which is "John is *less* than 1m50 tall", does argue that John is a short basketball player.[6]

[6]The idea of using the complement of the true answer was initially motivated by Dutch examples of RQs involving negation, like the following:

(i) *Immers, hoe groot is Jan niet?*
After all, how tall is John not?

I leave the issue of how negation functions in this kind of RQs for future research.

As for the case of Es, it is necessary to use the *true* answer for arguing (in Condition 2) rather than the *true exhaustive* answer. There are at least two motivations for this. First, using the true answer or its complement lets us see that arguing with RQs is monotone. If John is 2m tall, and I think it is a good argument for accepting John to the basketball team, I can use the respective how-RQ to express this. Was John even taller than 2m, it would also be a good argument for accepting John, and I could use the same RQ. This is a consequence of using the true vs. the true exhaustive answer because the true answer (the proposition "John is at least 2m tall" in our case) is compatible with John being even taller. This is not true for the true exhaustive answer because it expresses the exhaustive proposition "John is exactly 2m tall". The same happens in a low degree scenario: if I can use a how-RQ to argue that John is really short when he is 1m50, it would be possible to use the same RQ was John 1m40. The complement of the true answer allows for this.

The second reason to use the true answer vs. the true exhaustive answer is that the true answer predicts that how-RQs are not felicitous in precise degree scenarios. This was predicted incorrectly in Rohde's theory. Consider example (30b), which is infelicitous in the scenario (30a). However, if we take the true exhaustive answer ("John is precisely 1m 99cm 99mm tall" in this case) to provide an argument for the salient issue, the RQ is predicted to be felicitous, which is undesirable. The same kind of undesirable prediction one would get in average degree scenarios.

4.4 Discussion of the proposal for RQs

In fact, what my theory for RQs predicts is not Observation 1, but only its weaker version, namely that how-RQs provide monotone arguments. This means that if one can argue with a gradable predicate holding to some degree, he would also be able to argue were the degree even higher (or lower). Therefore, arguing with RQs is possible for monotone issues (for (37b): John is taller than 1m90; for (42b): John is shorter than 1m70), but not for "intervals", like in the average degree scenario (40a). However, I cannot derive that the degree to which the gradable property from a how-RQ holds has to be extreme.

For example, how-RQs might be felicitous in average degree scenarios when higher degrees would still provide a good argument. In the following context John is quite short (1m65), but he is high enough for being let to a ride.

(43) a. (We are in an amusement park, and we'd like to go to a ride. It is allowed only for people taller than 1m60) Of course, John can join is!
b. *After all, how tall is he?* (1m65)

If John was taller than 1m65, of course, he would still be allowed to the ride. My theory of RQs predicts that this RQ should be felicitous (indeed, just replace 1m90 for 1m65 in the reasoning about (37a)). It needs to be checked if this is a desirable prediction.

Notice that the difference between the average degree scenario (43a) and the high degree scenario (37a) is that in the first one the cut-off point is explicitly specified (1m60), whereas in the second one it is implicit (John is a tall basketball player). Therefore, a possible way out would be to assume that the cut-off point is set by default as average, unless specified

explicitly. For (37a), again, it means that John is taller than an average basketball player, whereas in (43a) John is taller than some explicitly specified height.

Another side of the same issue is that RQs are predicted to be infelicitous in high degree scenarios if they cannot perform a monotone argument:

(44) a. (We're choosing a road bike for John. A frame of the size 63 is for people of the height 1m92-1m94) I think we should choose a frame size 63.
b. #*After all, how tall is John?* (1m93)

Regardless the fact that John is really tall, and his height fits well for the frame size, the RQ does not seem to be felicitous in this case. This is presumably because if John was higher, this would not be a good argument for choosing the same frame size.

Unfortunately, I do not have clear data for both cases to judge if my predictions are desirable. If they are not, this would be an argument in favour of Rohde's theory. In her approach extreme degrees are directly encoded in one of the felicity conditions, which completely excludes the use of RQs in average degree scenarios. There is even a way around against directly including extreme degrees into felicity conditions, which is closer to my view of RQs. We could add to the discourse function of RQs (arguing) a "preference for extreme degrees", the latter being a consequence of RQs expressing speaker's emotions. As Rohde formulates it, midpoint values on a scale are "unavailable as obvious answers because they provide less ammunition for an emotional proclamation". Adding this preference to my theory (or to Rohde's last felicity condition) would explain why how-RQs can be used only with extreme degrees.

5 Formal details

There are a number of points in the proposal that need to be specified. For example, there are at least two options for the question denotation: (Groenendijk and Stokhof, 1982) and (Karttunen, 1977). In fact, it matters which question semantics to use. Taken literally, Karttunen's denotation for the question "Who did Jan invite?" is the empty set in case when Jan did not invite anyone. Therefore, the true answer to the respective RQ would be the empty set, and could not be used for arguing. On the other hand, choosing Groenendijk&Stokhof's question semantics has as a consequence that only the true exhaustive answer is definable, and not the true answer (Heim, 1994). As was shown, however, being able to use both the true and the true exhaustive answer is important in my proposal for both Es and RQs. In this section I will spell out the question semantics I suggest to use and how to calculate the two answers from it.

Let us start with the Karttunen's question semantics. When Jan did not invite anyone, the denotation of the wh-clause underlying the question "*Who did Jan invite?*" is the empty set. This is because the question presupposes that Jan invited someone:

(45) $[\![wh-clause]\!](w) = \{p \mid \exists x\ (p = \lambda w'.[\![invited]\!](w')(x)(j)\ \&\ [\![invited]\!](w)(x)(j))\} = \emptyset$

Therefore, $answer_1$, which is the conjunction of all true answers, is also the empty set. In

my theory for RQs the true answer is used to argue, so in example (25b) the empty set (the contradictory proposition) would have to be used for arguing. I suggest adding the proposition that Jan did not invite anyone to the denotation of the wh-clause:

(46) $[\![wh-clause]\!](w) = \{p \mid \exists x\ (p = \lambda w'.[\![invited]\!](w')(x)(j)\ \&\ [\![invited]\!](w)(x)(j))\} \cup \{\lambda w'.\ \neg\exists x\ [\![invited]\!](w')(x)(j) \mid \neg\exists x\ [\![invited]\!](w)(x)(j))\}$
$= \{\lambda w'.\ \neg\exists x\ [\![invited]\!](w')(x)(j)\}$

Now, $answer_1$ is the proposition that Jan did not invite anyone, which is used for arguing why Jan was alone at the party.

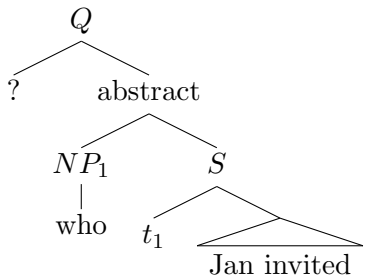
As for Groenendijk&Stokhof's question semantics, the denotation of the wh-clause "*Who did Jan invite?*" when Jan invited Marie is as follows:

(47) $[\![who\ Jan\ invited]\!](w) = \lambda w'.\ \forall x\ ([\![invited]\!](w')(x)(j) = [\![invited]\!](w)(x)(j))$, i.e. the proposition that Jan invited Marie (and only her)

If Jan did not invite anyone, the denotation of the wh-clause is the respective proposition, therefore the problem above does not arise. However, there is a different problem, namely that the denotation in (47) is the Heim's true exhaustive answer, from which the true answer is not definable (Heim, 1994), whereas we need both answer concepts for the theories of Es and RQs.

Let us look closer at the Logical Form of the question "*Who did Jan invite?*". It combines the sentence with a trace with two other pieces, a wh-phrase and an question operator "?":

(48) a.



b. abstract: $\lambda w'\lambda x.\ [\![invited]\!](w')(x)(j)$

c. $[\![?]\!] = \lambda p\lambda w\lambda w'.\ [p(w) = p(w')]$

d. Partition: $Q = \lambda w\lambda w'.\ \left[\{x \mid [\![invited]\!](w')(x)(j)\} = \{x \mid [\![invited]\!](w)(x)(j)\}\right]$

e.

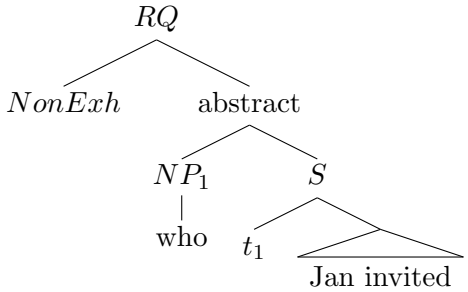
Jan invited Marie, Peter, Kees		
Jan invited Marie, Peter	Jan invited Marie, Kees	Jan invited Peter, Kees
Jan invited Marie	Jan invited Peter	Jan invited Kees
Jan invited no one		

When the wh-phrase "*who*" is combined with S, it gives an abstract with the denotation in (48b). Further the question operator "?", which has the meaning in(48c), is applied to the abstract. The denotation of the wh-clause, which is on the top of the tree, is in (48d). It is a partition over the set of worlds. Each cell in (48e) is an equivalence class of worlds where exactly the same people are invited. For example, if in the actual world w Jan invited Marie,

the denotation of the wh-clause is the set of worlds where exactly Marie is invited, as in (47). The discourse role of the wh-question is that the speaker expresses a wish towards the hearer to choose the equivalence class of worlds with the correct answer from the partition.

What I would suggest is introducing an operator *NonExh* which makes a non-exhaustive answer out of an abstract. Then a respective speech act operator (exclamative or corresponding to RQs) can use the result in checking one of the felicity conditions. The non-exhaustive answer is what the speaker of an E is surprised at, and what is used for arguing in case of RQs. Informally, in case Jan did not invite anyone, we want as a non-exhaustive answer the proposition "Jan did not invite anyone"; if Jan invited Marie, the proposition "Jan invited (at least) Marie". The meaning of *NonExh* is in (49b). When it is applied to the abstract, it results in a relation between two worlds, which can be paraphrased as follows: if no one was invited in w, take only those w' where no one is invited; if in w a person x is invited, take all w' where x (and probably some other people) are invited. Formally it is defined in (49c):

(49) a.



b. $[\![NonExh]\!] = \lambda p \lambda w \lambda w'.\ (p(w) \neq \emptyset \wedge p(w) \subseteq p(w')) \ \vee \ (p(w) = p(w') = \emptyset)$

c. $RQ = \lambda w \lambda w'.\ \Big(\{x \mid [\![invited]\!](w)(x)(j)\} \neq \emptyset \wedge \{x \mid [\![invited]\!](w)(x)(j)\} \subseteq \{x \mid [\![invited]\!](w')(x)(j)\}\Big)$
$\vee \ \Big(\{x \mid [\![invited]\!](w)(x)(j)\} = \{x \mid [\![invited]\!](w')(x)(j)\} = \emptyset\Big)$

The result of applying *NonExh* to the abstract is a relation RQ/E between worlds. Then, in case of RQs, the speaker uses the set of worlds related to the actual world w, $RQ(w)$, or its complement for arguing for the salient issue. In case of Es, the speaker expresses his surprise at $E(w)$.

6 Discussion

In this paper I compared two kinds of "non-interrogative" questions, i.e. wh-constructions that do not have a prototypical interrogative function, namely RQs and Es. I showed that, among some other points, they can be compared with resect to their use in two types of contexts: those involving degrees, and those where the wh-variable introducing them is not instantiated. I described my proposal for Es and RQs based on question semantics, and showed how and why they can be used in the two kinds of contexts. The comparison I made between Es and RQs gives reasons in favour of a theory of Es based on a question denotation, rather than degree analyses.

Formulating the theories of Es and RQs, I used as basic question denotation the one suggested in (Karttunen, 1977), and two answer concepts from (Heim, 1994). Briefly, both Es and RQs can only be used if the speaker knows the true exhaustive answer to the underlying question. Es and RQs differ in their functions: Es express speaker's surprise at the true answer, and RQs are used for arguing with the true answer or its complement. I showed that Es involving degrees can express only extremely high degrees. This follows from monotonicity of gradable predicates and semantics of surprise. I also attempted to show that degree RQs involving extreme degrees. However, the data were not very clear, and I described a few options for improving my proposal.

There are many questions about the behaviour of Es and RQs that this paper leaves unanswered. First, what are the "prototypical" speech acts used for uttering Es and RQs? In this work I discussed only felicity conditions that the context must satisfy for Es and RQs to be uttered felicitously, but the nature of speech acts and their action on Common Ground was outside of consideration. Moreover, what is the status of felicity conditions I suggested for both Es and RQs? Obviously, felicity conditions for Es describe their behaviour, but they also need to be generalised from the particular case of wh-Es to Es in general (i.e. to include clauses like "*Susan has a car!*", "*John is so tall!*", etc.).

The second question concerns so-called "embedded Es", like: "*John is surprised at who Mary invited.*" Analogously to matrix Es, this utterance asserts that John is surprised at the true answer to the question "Who did Mary invite?" How do embedded Es achieve effects similar to matrix Es? Also, can RQs be embedded?

The third question is whether speaker's knowledge needs to be exhaustive, both in the case of Es and RQs. The hypothesis is that the speaker does not need to know the true exhaustive answer to the underlying question, and not even the true answer, but just some partial answer (see e.g. (Abels, 2004), which deals with issues on exhaustivity in embedded Es).

Finally, other non-interrogative questions need to be considered, especially those close to Es (namely pseudo-questions and incredulity questions). On basis of what properties can we distinguish them from each other? One hypothesis is that partly the distinction is made by intonation. The same probably holds for how-RQs involving extremely high and extremely low degrees. If this is the case, the class of high degree how-RQs must be contrasted with how-pseudo-questions.

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