How hard are hard triggers?[*]

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Abstract. We study Abusch's (2002; 2010) distinction between hard and soft triggers from an experimental point of view. We show that there are apparent counterexamples to the distinction, discuss their status and describe future experiments aiming at clarifying the processing issues that form the core of the problem.

Keywords: experimental semantics, presupposition, accommodation, hard triggers

1. Introduction

The literature on presuppositions (PP) suggests that not all PP triggers are equal. Some of them seem to entail rather strictly their PP, whereas others are more tolerant. There are several versions of this basic intuition. In this paper, we study Abusch's (2002; 2010) approach, which is based on an explicit suspension test, illustrated in (1), where the PP triggers are underlined.

(1)   a.   I don't know whether he participated but, if he <u>won</u>, . . .
       b.   ?? I don't know whether he participated, but, if Mary participated <u>too</u>, . . .

For most speakers, introspection leads to reject (1b). Items that behave like *too* are called *hard triggers* (HT) by Abusch. Those which behave like *win* are *soft triggers* (ST). This paper is mainly an experimental contribution to the study of the distinction between HT and ST. In section 2, we present briefly a number of works where relevant or analogous distinctions are drawn, before summarizing Abusch's proposal in section 2.5. In section 3, we describe three pilot experiments that address directly the HT vs. ST distinction. In spite of their limits, they show that the notion of local accommodation, which provides a basis for the HT vs. ST distinction, remains unclear in judgment tasks, because it involves processing issues that are beyond introspection. In section 4, we explain what the possible options are and set an agenda for our future experimental work using eye-tracking.

2. Variation in strength

2.1. Hard and soft triggers: the sources of the distinction

The difference between hard and soft triggers (HT and ST) was first noticed by Karttunen (1971). Karttunen's general idea is that, in order for a PP to be projected, this PP must be satisfied by the

context sentence. However, different triggers can have different projection properties, even when they are put in the same context. For example, consider the difference between (2a) and (2b).

(2)　　a.　　If I regret later that I have not told the truth, I will confess it to everyone.
　　　　b.　　If I realize/discover later that I have not told the truth, I will confess it to everyone.

Factive and semifactive verbs behave in different ways with respect to local accommodation. In (2a), the PP projected by a full factive like *regret* (i.e. 'I have not told the truth') is resistant to suspension, whereas in (2b) semifactives like *realize* or *discover* project a PP that is more easily suspendable.

2.2. PP projection and local accommodation

Zeevat (1992) establishes a threefold distinction, between lexical triggers, resolution triggers and triggers like *too* and *again*, that do not belong either to the first or to the second group. Such a distinction is based on the different accommodation properties of triggers. First, lexical triggers (e.g. factives) involve concepts and concept applicability conditions: the concepts can be applied only if these conditions are present in the context. The conditions for the concept to be applied are the lexical PP of the concept. This means that the applicability of the concept depends on the PP being true. Notice that, in Zeevat's framework, lexical triggers follow Heim's notion of accommodation (Heim, 1983).

Second, resolution triggers (e.g. definite descriptions, *when* and *after* clauses) are clearly anaphoric: like anaphora, they set up relations between different parts of a text. Thanks to their indexical nature, they refer to their antecedent and deliver a value to the current context in order to build a new concept. Although they attribute some properties to their referent, they do not demand these properties to be part of the agent's beliefs. This suggests that resolution triggers follow Van der Sandt's account of accommodation (Van der Sandt, 1989), as Van der Sandt's accommodation rule simply requires that the trigger have access to its antecedent or to the accommodation site.

The third category, which seems to intersect with Abusch's definition of HT, includes adverbs like *too*, *another* and *again*. Such triggers have relaxed accessibility constraints, in that they have the property of identifying antecedents in parts of the context that are not accessible to the other triggers. As showed by (3a,b), for example, *too* is able to look for its antecedent in both the consequent and the antecedent of a conditional.

(3)　　a.　　If John has time, he will visit us tonight. Mary will come too.
　　　　b.　　If John will come tonight, we must warn Fred. Mary will come too.

However, this account seems to be incomplete in three respects. First, as claimed by Zeevat him-

self, the accessibility constraints of *too* are not clear: the access to normally inaccessible parts does not arise in all cases. Further, it is not possible to account for such an irregular behavior on the basis of typical accommodation rules. Finally, it is unclear whether there is a principled reason that separates the third category of triggers from the resolution group.

Amaral et al. (2011) test Zeevat's account from an experimental point of view. Their aim is to check whether resolution and lexical triggers differ in the way they bring about backgrounding information. They implicitly operate a modification in Zeevat's classification, as they put triggers like *too* into the anaphoric category (which corresponds to Zeevat's resolution group). In their experiment, subjects are presented with written question-answer pairs; the question always contains a PP trigger, and either a positive or a negative answer is provided. An example of the target question-answer pairs is given below.

(4)   Q – Did Brian lose his wallet again?
       A1 –Yes, he did lose his wallet again. [Endorsing main content + endorsing PP]
       A2 –No, he didn't lose his wallet this time. [Refuting main content + endorsing PP]

Two types of contrasts are taken into account. The first compares the answers addressing the PP with the answers addressing the main content, while the second compares the positive and the negative answer. The authors make two predictions with respect to trigger behavior: in the case of PP denying, endorsing the main content should be better for the anaphoric than for the lexical triggers, while refuting the main content should be better for the lexical ones.

Concerning the results, as it was predicted, refutation is significantly better than endorsement for lexical triggers. However, two unexpected results come up. First, *still* behaves like a lexical trigger. Second, there is a difference between *too* on one side and *again* and *still* on the other. The hypothesis predicts that they should behave in the same way, but the results show that, for *too*, endorsing is better than refuting. This suggests that the distinction between lexical and resolution triggers is not always clear. Amaral et al.'s results are quite difficult to interpret. They try to give an empirical account of trigger classification, but they do not completely succeed in providing clear experimental evidence for it. Anyway, their results confirm that the category of PP triggers is not uniform.

2.3. PP projection and contextual neutralization

Abbott (2006) explicitly formulates the question of why HT are so hard to be locally accommodated. In her account, the distinction between HT and ST is based on contextual neutralization, as it is easy to find contexts which suspend soft PP. Look, for instance, at (5a,b): when *discover* and *know* are put in the antecedent of a conditional or in a modal context, the PP they trigger is easily neutralized.

(5) a. If anyone discovers that the rumour was a hoax, it will be a scandal.
     b. Perhaps God knows that we will never reach the stars.

ST include the following structures: cognitive factive predicates (e.g. *be aware*, *discover*, *know*), change of state verbs (*stop*, *start*, *continue*) and achievement verbs with a preparatory phase (e.g. *win*). HT, on the other hand, include emotive factive predicates (e.g. *forget*, *regret*, *be odd*), definite descriptions, cleft constructions and manner adverbials (*also*, *even*, *too*, etc.). Abbott's framework is based on the notion of detachment. The idea is that a speaker who chooses to add optional information intends to convey it. In such a case, it is easy to detach optional information through rephrasing. Therefore detachment expresses the property of finding a form which expresses the main content without expressing the PP. As there is no other reason for that particular information to be included in the utterance, we expect it to be not easily neutralizable by context. This argument can be applied to the HT vs. ST distinction, as the PP of HT corresponds to pieces of information which are orthogonal to the main content. Since hard PP are detachable, they cannot be easily neutralized. Consider, for instance, the contrast between (6a) and (6b).

(6) a. Mary hit the target again.
     b. Mary hit the target.

What would be the point of using (6a) instead of (6b)? The only reason for the speaker to include *again* in the utterance is that she wants to convey that Mary hit the target previously. In that case, the sentence could be easily reformulated detaching the information communicated by *again*. Following Abbott's rule, we say that *again* is not easily neutralized by context, therefore it can be considered as a HT. On the contrary, the PP of a ST is hardly detachable, thus it can be easily neutralized by context.

However, this analysis has two main problems. First, as noticed by Abbott, non-cognitive factives like *regret*, *be sorry* etc., should be defined as HT: they are not easily detachable, hence they should be neutralizable. But we find exactly the contrary. Non-cognitive factives are resistant to local accommodation. Second, consider a verb like *stop*: in Abbott's account, it should be considered as a ST, hence it should be nondetachable. Nevertheless, consider the sentences in (7): (7b) is a part of the main content of (7a). Then, why is it not a viable, detached alternative to the sentence containing the PP?

(7) a. Paul has stopped smoking.
     b. Paul does not smoke.

Finally, it is not clear whether Abbott neutralization and Abusch epistemic suspension are one and the same. In fact, Abbott claims that Abusch's examples are cases of contextual neutralization. However, when we look at Abusch's sentences, we see that they are better defined as cases of PP suspension, namely cases in which the truth of the PP is left hanging.

2.4. PP projection and at-issueness

Abbott's notion of detachment implies a distinction between the optional information and the information which is at-issue. The notion of at-issueness has been employed to provide an account of projection behavior (Simons et al., 2010). At-issueness is defined with respect to Question Under Discussion à-la Roberts : a proposition p is at-issue if and only if the speaker intends to address the QUD through the question whether p. The idea is that only not-at-issue contents can project. PP are usually not-at-issue, so they show a projective behavior. However, PP can be at-issue (even if, usually, they are not). In that case, they fail to project. In the example below (taken from Simons et al. (2010)), the A sentence can be an answer to both question Q1 and question Q2. In the first case the PP triggered by *know* (i.e. 'Harry is dating Sally') is not-at-issue, hence it can project. In the case of Q2, on the contrary, the PP cannot project as it is at-issue.

(8)   Q1 –What does Bill think about Harry dating Sally?
        Q2 –Is Harry dating Sally?
        A – Bill doesn't know that he is.

Xue and Onea (2011) show experimentally the correlation between at-issueness and projection behavior. They construct two experimental tasks in order to test the difference between four PP triggers: *know*, *find out*, *too*, *again*. In the first task, sentence-question pairs are provided. Each pair includes one target conditional sentence and a question task. As showed by (9b), questions aim at rejecting the PP triggered in the target sentence (9a). Moreover, three possible answers are provided, cf. (10). If the subjects think that it is possible that Christine does not like tea, the target PP fails to project. On the contrary, if they think that it is not possible that Christine does not like tea, the PP triggered by *know* is projected.

(9)   a.   If Paul knows that Christine likes tea, he will give her a teapot as a present.
        b.   Is it possible that Christine doesn't like tea?

(10)   a.   Yes, it's possible.
        b.   No, it's not possible.
        c.   I don't know.

Results show that the PP triggered by *too* and *again* can be more easily projected than the PP triggered by *know* and *find out*. However, there is a significant difference between *know* and *find out* that cannot be explained in Xue and Onea's framework, based on at-issueness.

In the second task, the same four triggers are tested with respect to at-issueness. As shown in (11), each stimulus consists of a target sentence and three answer options. All the three answers contradict the PP triggered: (11d) constitutes a direct denial, whereas (11c) and (11b) are more indirect. The prediction is that if the PP is at-issue, the subjects will deny it directly.

(11)   a.   Tina has just found out that Max is on vacation.
       b.   Yes, and Max is not on vacation at all.
       c.   Yes, but Max is not on vacation at all.
       d.   No, Max is not on vacation at all.

Analyzing the results, Xue and Onea remark that the PP triggered by *know* are more often rejected than the PP triggered by *find out*, which entails that they are more likely to be at-issue. Moreover, the PP triggered by *find out* are more likely to be at-issue than those triggered by *too* and *again*. This suggests that each PP trigger is associated to a probability of reconstruction of a not-at-issue context. However, some problems remain unsolved. First (as noticed by Xue and Onea themselves), it is not clear whether the observed correlation between projection and not-at-issueness is a causal one. Second, it has been noted that triggers like *too* and *again* can hardly be at-issue. How come? Given that at-issueness is pragmatically determined, is the probability of not-at-issueness influenced by the lexical nature of triggers? Is there a link between the semantic content of triggers and their ability to appear in an at-issue context? Finally, the structures of the sentences used in the two tasks are quite different: in the first experiment, the trigger is embedded under a suspending operator, whereas in the second experiment the PP projects as usual. In order to test the suspension properties of different categories of PP, triggers should be embedded in target sentences with the same structure. This suggests that it would be useful to find a sort of suspension-test structure. Such a structure is provided by Abusch (2002, 2010).

2.5. Abusch's suspension test

Abusch's main idea (2002; 2010) is that HT are resistant to local accommodation, whereas ST can be more easily suspended and then locally accommodated. Abusch provides a test in order to make this property more explicit. The pattern is: *I don't know whether* p, *but if* p' ..., where p' presupposes p. So, the test structure consists of a sequence: sentence expressing ignorance about the presupposed content + conditional sentence. The PP trigger always occurs in the antecedent of the conditional. The initial sentence suspends the presupposed content, which has then to be locally accommodated at the level of the antecedent. For instance, look at the difference between (12) and (13)-(14). Abusch argues that the PP triggered by *win* passes the test, whereas in the case of *too* and clefts the sentence sounds "odd, if not completely inacceptable".

(12)   I don't know whether John ended up participating in the Road Race yesterday. But if he won it, then he has more victories than anyone else in the history.

(13)   ?? I don't know whether anyone read that letter. But if it is John who read it, let's ask him to be discreet about the content.

(14)   ?? I don't know whether John read that proposal. But if Bill read it too, let's ask them to

confer and simply give us a yes-no response.

Too and clefts are thus considered as cases of HT, whereas ST include the following categories: achievement verbs with preparatory phases (e.g. *win*), inchoatives (e.g. *break*, *grow up*, *dry*), contrastive statives (e.g. predicates such as *newcomer* or *bachelor*), affirmation-negation structures (e.g. *John is in Boston and not in New York*), verbs of reciprocal and accompanied action (e.g. *accompany*), questions and intonational focus.

Surprisingly, the status of *too* as a HT, which is apparently unobjectionable, proves less robust than currently believed. Consider (15). It seems that it makes perfect sense: I'll avoid the party because if I go and John goes to, there will be unpleasant consequences. (15) is difficult to interpret without assuming some local accommodation.

(15)   I won't go to the party because, if John goes too, I'll have to endure the kind of stupid conversation he is fond of.

3. An experimental approach

In order to assess the robustness of Abusch's characterization of HT, we ran three experiments. The first two are just fast pilot experiments whereas the last one is a little more ambitious.

3.1. A first try at investigating the perception of HT and ST

3.1.1. First experiment

The first experiment aimed at determining whether subjects distinguished between HT and ST. They were asked to rate sentences on a seven-point scale of naturalness. We considered the case of *too* and *it*-clefts vs. *win*, with two subcases for each category.

Material   There were 15 stimuli, including 6 fillers, 6 targets and 3 controls. The experimental stimuli are given below in figure 1. The control for *win* (win.co) makes the PP that Peter participated in the race an explicit member of the speaker's information state. The first target (win.with.ana) replicates Abusch's structure for *win*. It is said to be 'anaphoric' because of the pronoun. There is another version (win.wo.ana), where the PP that Peter participated is replaced by a weaker PP that someone participated in the ignorance statement *I don't know whether . . . .* The control for *too* makes the PP explicit. Too.with.rel makes the conclusion of the conditional sentence relevant to the combination of the accommodated PP and the explicit antecedent. If Paul *and* John read the letter, they will be *both* angry with Mary. In too.wo.rel the conclusion does not convey any obvious link to the PP content. Cleft.co is analogous to the other controls. Cleft.with.ana

and cleft.wo.ana reproduce the same distinction as for *win*.

Category	Text
Context	Peter is a specialist of the New York marathon, that he won four times
win.co	*I know that Peter participated in the race. If he won, he has got more victories than anybody else in history.*
win.with.ana	*I don't know whether Peter participated in the race but, if he won, he has got more victories than anybody else in history.*
Context	During an important athletics meeting the participants to the 5000 metres are coming by plane. The weather conditions are so bad that it's not certain that they will be able to reach their destination. It's particularly frustrating for Peter, who is a super champion of the 5000 metres.
win.wo.ana	*I don't know whether someone could participate in the race, but, if it's Peter who won, he has got more victories than anyone else in history.*
Context	Mary wrote a letter to her boss, to accuse her colleagues, Paul and John, to be inefficient at work.
too.co	*I know that Paul read the letter. If John read it too, they will be both angry with Mary.*
too.with.rel	*I don't know whether Paul read the letter, but, if John read it too, they will be both angry with Mary.*
too.wo.rel	*I don't know whether Paul read the letter, but, if John read it too, we'll ask him to be discreet about the content.*
Context	There exists a secret document containing embarrassing revelations for a major political party. Michel is a member of the party and has a reputation for being unable to hold his tongue.
cleft.co	*I know that someone read the document. If it's Michel, we'll ask him to be discreet about its content.*
cleft.with.ana	*I don't know whether Michel or someone else read the document but, if it's him who read it, we'll ask him to be discreet about its content.*
cleft.wo.ana	*I don't know whether someone read the document but, if it's Michel who read it, we'll ask him to be discreet about its content.*

FIG. 1 **Target material for experiment 1**

Method and results   160 students participated. They were divided into 6 groups, where no group saw a target and its control or two targets for the same trigger. The following table contains the net results.

	Sentence.Type	Nb.Subjects	Mean	Variance
1	too.with.rel	30	4.80	3.13
2	cleft.co	51	6.29	0.89
3	too.wo.rel	25	5.20	2.67
4	win.co	42	6.02	0.95
5	cleft.with.ana	28	6.07	1.40
6	too.co	50	6.40	0.78
7	cleft.wo.ana	27	5.44	2.56
8	win.with.ana	26	5.92	1.67
9	win.wo.ana	24	6.00	2.70

FIG. 2 **Net results for experiment 1**

An analysis with the R *nparcomp* package (Konietschke, 2012) provided the following table, where we show only the confidence intervals of direct interest. The numerical results at the bottom indicate the estimated probability with its lower and upper bounds at 95% confidence (Brunner and Munzel, 2000).
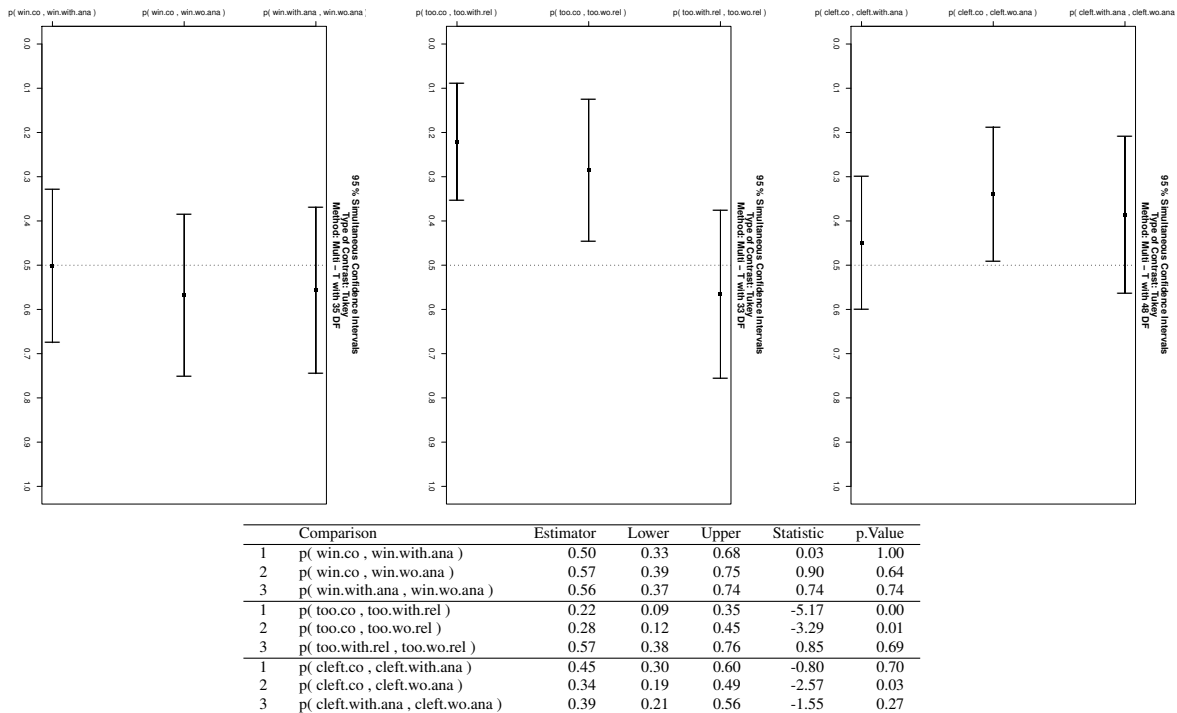
	Comparison	Estimator	Lower	Upper	Statistic	p.Value
1	p(win.co , win.with.ana)	0.50	0.33	0.68	0.03	1.00
2	p(win.co , win.wo.ana)	0.57	0.39	0.75	0.90	0.64
3	p(win.with.ana , win.wo.ana)	0.56	0.37	0.74	0.74	0.74
1	p(too.co , too.with.rel)	0.22	0.09	0.35	-5.17	0.00
2	p(too.co , too.wo.rel)	0.28	0.12	0.45	-3.29	0.01
3	p(too.with.rel , too.wo.rel)	0.57	0.38	0.76	0.85	0.69
1	p(cleft.co , cleft.with.ana)	0.45	0.30	0.60	-0.80	0.70
2	p(cleft.co , cleft.wo.ana)	0.34	0.19	0.49	-2.57	0.03
3	p(cleft.with.ana , cleft.wo.ana)	0.39	0.21	0.56	-1.55	0.27

FIG. 3 **Contrasts for experiment 1**

Conclusion   The results support Abusch's claim that *win* is a weak trigger. There is no significant difference between the case where the PP is explicit (win.co) and the other cases (win.with.ana and win.wo.ana). Additionally, the two subcases (with and without anaphor) are not different. In contrast, too.co is significantly different from the other two subcases, which are mutually equivalent. The case of clefts, which are HT according to Abusch, is slightly different since cleft.with.ana is not different from the control. We conjecture that this is related to such seemingly natural examples as (16). However, this kind of example needs further investigation as their interpretation apparently uses local accommodation.

(16)   I don't know whether Michel read the document, but if it's him, we'll ask him to remain discreet about its content.

These observations are in need of confirmation, since we had only one sentence per category per subject, a fact which leaves open the possibility that the effect (contrast) was due to individual features of the stimulus.

3.1.2. Experiment 2

Material   We present only the stimuli of direct interest in the context of this paper, ignoring other, more exploratory, stimuli. We had two more target sentences with *win* and three sentences for *too*. The control was different from the two targets in order to provide more diversity.

Category	Text
Context	The local newspaper started a short story contest with a very tight deadline. Competitors had three days to submit their manuscript.
win.with.ana	*I don't know whether Mark participated in the contest but, if he won, this suggests that he is fairly talented.*
win.wo.ana	*I don't know whether someone participated in the contest but, if Mark won, this suggests that he is fairly talented.*
Context	The text of a paper is to be read over, in order to minimize the risks of mistakes.
too.co	*I know that Julia checked the paper and, if Andrea checked it too, we can send it.*
Context	Paul and Mary had an argument and don't want to be together on any occasion
too.ign.but	*I don't know whether Paul will go to the party, but, if Mary goes too, it will be embarrassing.*
too.ign.bec	*I don't know whether Paul will go to the party because, if Mary goes too, it will be embarrassing.*

FIG. 4 **Target material for experiment 2**

Method and results   There were 154 participants, divided into 6 groups, with 2 controls and 2 targets for each group. Again, no group saw two targets for the same trigger or a target and its control. The net results and the contrasts are as follows.

	Sentence.Type	Nb.Subjects	Mean	Variance
1	win.co	42	6.02	0.95
2	win.with.ana	23	5.61	2.61
3	win.wo.ana	24	5.54	3.91
4	too.co	47	5.68	2.44
5	too.ign.but	26	4.92	2.47
6	too.ign.bec	27	5.26	2.74

FIG. 5 **Net results for experiment 2**

	Comparison	Estimator	Lower	Upper	Statistic	p.Value
1	p(win.co , win.with.ana)	0.45	0.27	0.63	-0.66	0.79
2	p(win.co , win.wo.ana)	0.49	0.31	0.67	-0.16	0.99
3	p(win.with.ana , win.wo.ana)	0.53	0.33	0.73	0.36	0.93
1	p(too.co , too.ign.bec)	0.42	0.26	0.59	-1.13	0.50
2	p(too.co , too.ign.but)	0.34	0.19	0.50	-2.49	0.04
3	p(too.ign.bec , too.ign.but)	0.43	0.24	0.62	-0.86	0.67
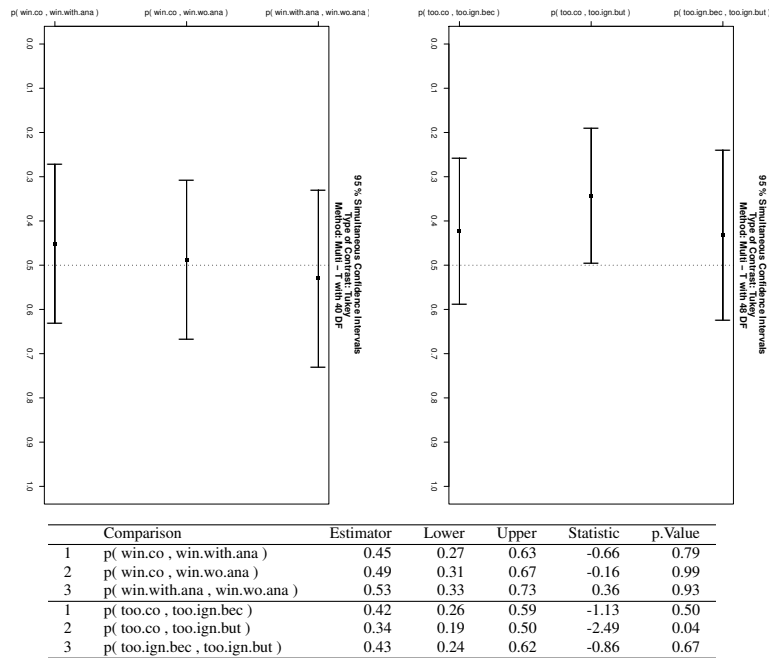
FIG. 6 **Contrasts for experiment 2**

Conclusion   The additional stimuli for *win* confirm Abusch's idea that *win* is a ST. More interestingly, the non-parametric test delivers a mixed result for the *because* vs. *but* comparison. *Because* is similar to the control whereas *but* is significantly different. However, the two items do not differ significantly between them. This is not problematic in itself since contrasts are not intrinsically transitive with respect to non-significant difference, that is, $A \approx B \,\&\, B \approx C$ does not entail $A \approx C$, where $x \approx y$ denotes the fact that there is no significant difference between x and y. Here, too.co $\approx$ too.ign.bec and too.ign.bec $\approx$ too.ign.but, but too.co $\not\approx$ too.ign.but.

3.2. Focusing on *aussi (too)*

The goal of experiment 3 was (i) to provide more observations on the *because* vs. *but* contrast with *too* and (ii) to compare the *because/but* forms with and without *too*. The intuitive motivation behind the latter test is the idea that accommodating the proposition corresponding to the PP could perhaps be independent from the presence of *too*. The target stimuli can be found at `http://perso.ens-lyon.fr/jacques.jayez/stimuli/`.

Method and results There were 82 participants divided into 6 groups. They had to evaluate 5 sentences in 5 contexts. Each sentence had the form: *I don't know whether p because/but, if p' too/ø, q.* where p' *too*, but not p' alone, presupposed p. The net results and the contrasts are shown below.

	Sentence.Type	Nb.Obs	Nb.Subjects	Mean	Variance
1	bec.with.too	99	40	6.25	3.33
2	but.wo.too	100	40	5.08	3.85
3	bec.wo.too	93	37	5.73	4.24
4	but.with.too	92	37	5.68	3.62

FIG. 7 **Net results for experiment 3**

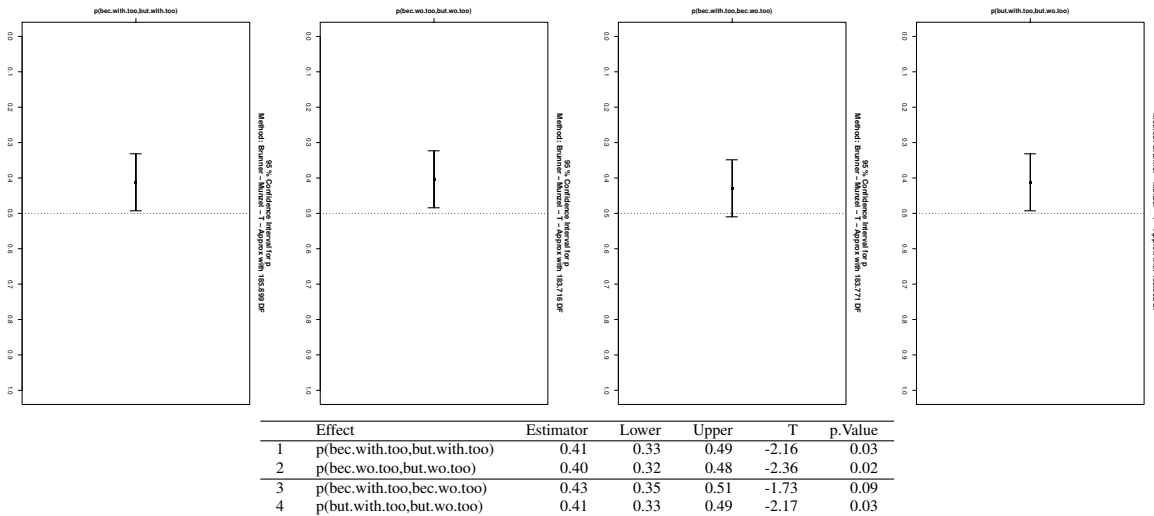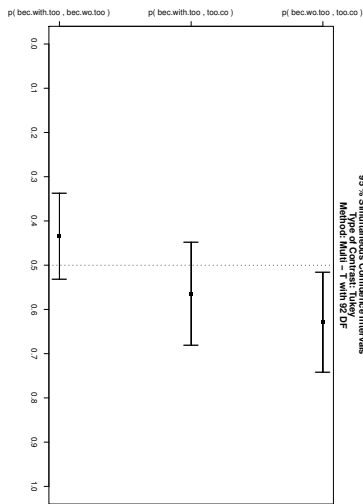|	Effect	Estimator	Lower	Upper	T	p.Value
1	p(bec.with.too,but.with.too)	0.41	0.33	0.49	-2.16	0.03
2	p(bec.wo.too,but.wo.too)	0.40	0.32	0.48	-2.36	0.02
3	p(bec.with.too,bec.wo.too)	0.43	0.35	0.51	-1.73	0.09
4	p(but.with.too,but.wo.too)	0.41	0.33	0.49	-2.17	0.03

FIG. 8 **Contrasts for experiment 3 (I)**

These results show that *because* and *but* give rise to markedly different judgments, thus confirming the introspective observation mentioned in section 2.5 . Moreover, the fact that bec.with.too and bec.wo.too are not significantly different suggests that the accommodated proposition is made accessible independently from the presence of the *too* trigger. However, when compared to the control of the second experiment, the impression is different since bec.wo.too is different from the control whereas bec.with.too is not.

	Comparison	Estimator	Lower	Upper	Statistic	p.Value
1	p(bec.with.too , bec.wo.too)	0.43	0.34	0.53	-1.61	0.25
2	p(bec.with.too , too.co)	0.56	0.45	0.68	1.32	0.39
3	p(bec.wo.too , too.co)	0.63	0.52	0.74	2.72	0.02

FIG. 9 **Contrasts for experiment 3 (II)**

General conclusion It is very likely that *gagner* (*win*) is a ST. The situation is much less clear for the alleged HT that we have been considering. Clefts give rise to results that are difficult to interpret and deserve new systematic experiments. *Aussi* (*too*) seems to be perfectly compatible with local accommodation in certain contexts, which invite a counterfactual interpretation. Clearly, a more precise experimental investigation would be welcome.

4. Experimental follow-up

4.1. Back to theory

In this section, we discuss only the case of *aussi* and address three questions. First, would it be possible that the observed differences are due to differences in discourse structure? Some results from experiment 2 could be taken as an indication in this direction. In addition to ignorance initial clauses (*I don't know whether . . .*), we had negative sentences such as *Paul won't go to the party because/but, if Mary will go too, it will be embarrassing*, in the too.bec and too.but categories respectively. Too.bec is significantly better than too.but. This makes sense if one assumes that the two discourse structures obtained by making the PP explicit are different, which seems to be the case since (17a) sounds more natural than (17b), which is improved by reading the initial clause as modal or echoic/evidential ('Paul probably won't go to the party' or 'People say that Paul won't go to the party').

(17)   a.   Paul won't go to the party because, if he goes, and Mary goes too, it will be embarrassing.

b. ?? Paul won't go to the party but, if he goes, and Mary goes too, it will be embarrassing.

However, if the explanation for the observed contrasts was to be found in discourse structure alone, the reason why contrasts extend to ignorance structures would remain mysterious. In the ignorance counterpart to (17), (18), the two subordinate clauses with *because* and *but* seem to be much more similar than the two parallel clauses in (17).

(18) a. I don't know whether Paul will go to the party because, if he goes, and Mary goes too, it will be embarrassing.
      b. I don't know whether Paul will go to the party but, if he goes, and Mary goes too, it will be embarrassing.

We conclude that, while discourse structure can play a role, it is not the main factor, and perhaps not even a factor, in the case of ignorance structures.

A second question is the role of counterfactuality. In experiment 2, the non-ignorance version (too.because), shown in (19), was rated very favorably by the subjects (mean = 6.12, variance = 2.03) when compared to the non-ignorance version for but, too.but (mean = 2.52, variance = 2.54).

(19) Paul won't go to the party because, if Mary goes too, it will be embarrassing.

Clearly the future situations considered in the antecedent of the conditional are counterfactual with respect to the initial assertion that Paul won't go to the meeting. This shows that local *counterfactual* accommodation is possible with a HT. The situation is apparently entirely parallel for (some) ST, see (20).

(20) a. Thomas won't participate in the contest because, if he wins, he will have to say a few words in front of the entire school and he is just too shy for that.
      b. ?? Thomas won't participate in the contest but, if he wins, he will be very happy.

The contrast between *because* and *but* under counterfactual interpretations is not surprising. Examples like (17b) and (20b) convey a contradiction. The speaker explicitly denies some proposition p before assuming that it might be true. In the *because* cases, the speaker explains why p cannot be true by implying that an agent entertains some plan containing counterfactual situations where p is true. The connection between counterfactuality and planning has probably a firm cognitive basis. Recent research on the brain regions recruited in counterfactual reasoning (Barbey et al., 2011) suggest an interaction between various regions specialized in the treatment of different aspects of representational networks dubbed *Structure Event Complexes* (SEC). SEC contain information about features present in courses of events, such as agents and their mental states, objects, actions, and context settings. The various features and the strategies that help individuals to combine them correspond in part to functionally distinct regions. Of special relevance is the fact that counter-

factual reasoning demonstrably involves anticipation of regret (Coricelli et al., 2005) and, quite generally, is triggered by problem anticipation. So, one can expect that discourses describing reasons for avoiding a course of actions are intimately connected with counterfactual accommodation. However, the way in which linguistic cues are used to construct an avoidance interpretation in the first place remain to be investigated.

The last point to be addressed is the possibility of a diagnostic concerning HT and ST. There is at least one simple hypothetical scenario that would allow us to keep the distinction between ST and HT, essentially along the lines of Abusch. Assume that the linguistic cues trigger an avoidance interpretation, which is cognitively connected, as we just saw, to a counterfactual interpretation. Then, the question arises of what linguistic cues are sufficient to help construct the observed interpretation. If the linguistic sequence *before* the trigger contains enough resources for the counterfactual interpretation to emerge, the missing PP is accommodated as a standard proposition, that is, independently from the trigger and without any presuppositional status. In that case, the trigger finds the antecedent it needs at the moment it is perceived and *does not cause any local accommodation*. We have just a normal case, where a PP trigger finds an antecedent in the context. The interpretation sequence is represented in (21).

(21)   a.   I don't know whether Paul will go to the party because if Mary goes [lexical material]
         b.   I don't know whether Paul will go to the party because if he goes and Mary goes [interpretation]
         c.   I don't know whether Paul will go to the party because if (he goes)$_i$ and Mary goes too$_i$ [resolution]

Alternatively, if the set of linguistic cues available before the trigger occurs is not sufficient for the required interpretation (accommodation) to obtain, we have to admit that other pieces of linguistic information, including probably the trigger itself, play a role in the derivation of the PP. In that case, it seems that Abusch's claim about HT has to be at least qualified. Since the missing PP is recovered after the trigger is seen, it is not possible to say that the trigger finds something that has been previously derived. So, one has to admit that HT are not incompatible with local accommodation. More precisely, we would suggest the following characterization.

(22)   A HT is a presuppositional item or construction that looks for an antecedent which (a) is already present in the context at the moment the trigger occurs or (b) has maximum likelihood given the context.

Condition (22b) does not require that the PP be already present at the moment the trigger occurs, nor that the context be limited to information available before the trigger occurs. In fact, it is possible that a likelihood estimation needs lexical material occurring *after* the trigger, in our case the consequent of the *if*-clause.

The observations we gathered up to now suggest the following conclusions.

1. HT are not compatible with local accommodation if there is no linguistic material, different from the trigger itself, that could make the accommodated PP salient/plausible. This is supported by the difference between the too.co vs. too.ign.bec and too.co vs. too.ign.but in experiment 2 and also by the but.with.too vs. bec.with.too contrast in experiment 3, see figures 6 and 8.
2. The idea that the missing proposition could be accommodated before the occurrence of the trigger seems to clash with the observations in figure 9. If the trigger played no role other than absorbing a proposition that has been made salient/plausible before, one would expect the version with *too* and the version without *too* to pattern similarly with respect to the control. Actually, the version with *too* is much nearer to the control than the version without *too*, even though they are not mutually significantly different.

If these observations were to be confirmed, a natural conclusion would be that HT differ from ST only by the degree of likelihood they expect to find in the context. Whereas ST accept local accommodation without any extra requirement (other than consistency), HT accept local accommodation when the accommodated proposition is strongly favored by the context.

4.2. Eye-tracking experiment

In order to study the processing of our stimuli, we have planned an eye-tracking experiment based on the same type of material as for experiment 3. It is well-known that the study of eye movements can shed light on co-reference processing, see Nair (2008) for a recent reappraisal. It is impossible to discuss here the role of all the possible eye-tracking measures and we limit our remarks to the three traditional regions of interest that are mentioned in the literature on reference resolution, that is the trigger itself (*too*), the post-trigger region and the antecedent. The reader is referred to Rayner (1998) for a description of the main standard measures. In what follows the 'target' is the trigger (*too*).

The general idea is to compare 5 conditions: a control condition where the proposition corresponding to the PP is explicit and the target can find its antecedent without accommodation, a *but*-with-target condition, a *because*-with-target condition, a *but*-without-target condition and a *because*-without-target condition. The relevant measures are at least: (a) for the target, Gaze Duration (GD) and Go-Past Time (GPT), aka Regression Path Duration, i.e. the sum of all fixations from the first to the last on the target (i.e. before leaving the target on the right), including regressive fixations on the left of the target, (b) for the post-target region, spillover effect (SP), i.e. first fixation durations on the right of the target, and Regressions Out (RO), i.e. the frequency of regressions from the post-target region to earlier parts of the text, (c) for the pre-target region, Regressions In (RI), i.e. the frequency of regressions to the pre-target region from later points in the text, typically from the target to a part of its antecedent, and reprocessing time (RT), i.e. the sum of all fixation durations on the region after the first-pass.

If, following Abusch, the HT is entirely 'passive', meaning that it does not prompt any accommodation but just expects an antecedent to be around at the moment it (the trigger) occurs, we should not find strong differences between the control and the *because*-with-target condition in the post-target region (SP and RO). Since the missing proposition becomes available *before* the occurrence of *too*, processing the consequent of the *if*–clause, that is, the post-target region, should be similar in both cases. Moreover, when comparing the *because* versions with and without the trigger, the expectation is that what corresponds to the post-target region (the consequent of the *if*-clause) should not be subject to significantly different explorations (SP and RO). The trigger is supposed to not contribute substantially to recovering its antecedent. So, in the version without the trigger, the 'antecedent' (e.g. the proposition that Paul goes to the party) is available after the explicit *if*-clause (*if Mary goes*) has been processed, exactly like in the version with the trigger. In contrast, significant differences should appear between the *but*-with-target and the *because*-with-target conditions (at least effects on GD, GPT, RI and RT).

Alternatively, if the trigger has its say in accommodation, the eye-tracking observations will be mixed and certainly more difficult to interpret. For instance, the versions with and without the target will probably be different in the post-trigger region. The control and the *because*-with-target conditions should also be markedly different.

5. Conclusion

Obviously, there are reasons to reexamine Abusch's distinction between HT and ST. Our preliminary results suggest that the distinction could be more fine-grained than what has been generally assumed. The idea that PP triggers have various strengths is not new, as noted in section 2. However it is striking that even a trigger like *too*, whose 'hardness' was taken to be unproblematic, raises problems. Further experimental research should help us to determine whether its status as a HT has to be retained or partially abandoned and, more generally, whether the question of HT must be rethought.

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