

Presupposition diversity: Soft and hard presupposition triggers in (non-)embedded contexts

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Abstract. The paper provides psycholinguistic evidence that the distinction between soft and hard presupposition triggers is sensitive to clauses embedded under attitude, reporting, and emotive verbs. The paper argues that these contexts represent yet another type of context along with Family of Sentences (antecedent of conditional, modal assertion, and yes / no question) that facilitate presupposition projection of hard triggers to a greater extent than that of soft triggers. The reason behind this lies in the distinction between global vs. local context of presupposition projection: hard triggers are globally projected, whereas soft triggers are either globally or locally projected. The experiment reported in the paper was designed as a verification task, that is, the participants were presented with utterances followed by questions and were asked to evaluate the information conveyed by the questions according to the information conveyed by the utterances. The information in the questions violated the presupposition conveyed by the utterances. The following six Russian presupposition triggers were experimentally tested: the adverbs *opyat* and *snova* ‘again’, the particle *tozhe* ‘too’ (hard triggers), the attitude verbs *uznat* ‘find out’, *zabyt* ‘forget’ and the aspectual verb *zakonchit* ‘finish’ (soft triggers). The triggers took positions in the main, in the embedded clause, or in both. We used two experimental lists such that one of them targeted a trigger in the main clause, and the other one targeted a trigger in the embedded clause. The paper reveals that presupposition projection is not a default linguistic process since it is compatible with fallacies in pragmatic reasoning even for hard triggers in main clause contexts. Also, for the first time, the paper investigates combinations of soft and hard triggers in main and embedded contexts

and compares them to single soft and hard triggers, thus bringing presupposition projection to new frontiers.

Keywords: presupposition, presupposition triggers, soft, hard, embedded.

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Разнообразие пресуппозиций: мягкие и жесткие пресуппозитивные триггеры в синтаксически (не)подчиненных контекстах

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Аннотация. Статья приводит экспериментальное свидетельство в пользу различия между мягкими и жесткими пресуппозитивными триггерами, которое чувствительно в отношении подчиненных клауз, являющихся аргументами матричных предикатов пропозициональной установки, речевой деятельности и эмотивных предикатов. В статье показывается, что эти контексты представляют собой еще один тип предложений наряду с Семейством предложений (Family of Sentences), которые способствуют проекции пресуппозиции жестких триггеров в большей степени, чем мягких триггеров. Причина кроется в различии между глобальным vs локальным контекстом проекции пресуппозиции: жесткие триггеры проецируются в глобальном контексте, в то время как мягкие триггеры проецируются в глобальном или в локальном контексте. Эксперимент, изложенный в статье, был задуман как верификационное задание, т. е. испытуемые должны были оценить информацию,

представленную в вопросах, в соответствии с информацией, представленной в высказываниях. Информация в вопросах нарушала пресуппозицию высказываний. Следующие 6 русских пресуппозитивных триггеров были экспериментально протестированы: наречия *опять* и *снова*, частица *тоже* (жесткие триггеры), глаголы пропозициональной установки *узнать*, *забыть* и фазовый глагол *забыть* (мягкие триггеры). Триггеры занимали позиции в главной, подчиненной клаузе или в обеих клаузах. Было составлено 2 экспериментальных листа, так что в одном из них вопрос касался триггера в главной клаузе, а другой — триггера в подчиненной клаузе. В статье выявлено, что проекция пресуппозиции не является дефолтным языковым процессом, поскольку совместима с ошибками в прагматических рассуждениях даже для жестких триггеров в контекстах главной клаузы. Кроме того, впервые в статье исследуются комбинации мягких и жестких триггеров в контекстах главных и подчиненных клауз, и эти комбинации сопоставляются с единичными мягкими и жесткими триггерами.

Ключевые слова: пресуппозиция, пресуппозитивные триггеры, мягкие триггеры, жесткие триггеры, подчиненные клаузы.

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1. Introduction

1.1. Theoretical approaches to diversity of presupposition triggers

It has been well-acknowledged that presupposition is triggered by a variety of lexical items such as factive verbs, aspectual verbs, adverbs of manner, complementizers introducing temporal clauses, quantifiers, particles, etc. Such lexical items are referred to as *presupposition triggers*.

Presupposition triggers typically give rise to presupposition in assertive contexts. Also, presupposition *projects* (or survives) in other contexts such as negation [Langendoen, Savin 1971], antecedent of conditional, modal assertion, and yes/no question. Such contexts are called *Family of Sentences*, or *FoS*, cf. [Chierchia, McConnell-Ginet 1990]. An example of Russian presupposition triggers in FoS are given in (1)–(4). The triggers are highlighted in bold here and throughout the paper.

- (1) *Druzya ne **uznali**, chto kontsert otmenilsya.*
‘The friends did not **find out** that the concert had been cancelled’.
- (2) *Vozmozhno, druzya **uznali**, chto kontsert otmenilsya.*
‘Presumably, the friends **found out** that the concert had been cancelled.’
- (3) *Esli druzya **uznayut**, chto kontsert otmenilsya, oni rasstroyatsya.*
‘If the friends **find out** that the concert has been cancelled, they will get upset.’
- (4) *Druzya **uznali**, chto kontsert otmenilsya?*
‘Did the friends **find out** that the concert had been cancelled?’

Relying upon [Simons 2001], [Abusch 2002, 2010] argued for diversity of presupposition triggers with respect to their projection plausibility in survival contexts. According to that theory, the triggers divide into two major groups: hard vs. soft triggers. Hard triggers are projected in all the contexts of FoS, whereas soft triggers are projected in some (but not all) contexts of FoS. To illustrate, soft triggers such as the verbs *win*, *discover*, *know* are felicitously used in antecedent of conditionals, whereas hard triggers such as the particle *too* and the adverb *again*, are infelicitous in antecedent of conditionals. Cf. ignorance contexts introduced with *I have no idea whether* in (5) and (6).

- (5) *I have no idea whether John ended up participating in the Road Race yesterday. But if he **won** it, then he has more victories than anyone else in history.* [Abusch 2010: 39]

- (6) *I have no idea whether John read the proposal. # But if Bill read it too, let's ask them to confer and simply give us a yes/no response.*
[Abusch 2010: 40]

As argued in [Abusch 2002, 2010], the reason behind the suggested distinction lies in that hard triggers constitute a purely semantic phenomenon and, therefore, they project in all possible contexts, whereas soft triggers are pragmatically derived. More precisely, soft triggers are derived from sets of lexical alternatives. To illustrate, for *win* the alternative is *lose* and for *stop* the alternative is *continue*. By uttering a sentence with a soft trigger, the false alternative is eliminated, and the true alternative projects. Importantly, for both alternatives (*win* or *lose*, *stop* or *continue*), the presupposition is identical. For example, for the utterances *John won the race* / *John lost the race*, the information about John's participation in the race is presupposed. For the utterances *John stopped smoking* / *John continues smoking*, the information about John's smoking before is presupposed. How can we capture the contrast in (5) and (6)? To answer this question, let us firstly consider the dichotomy of the *local* vs. *global context*.

A global context refers to the context of a whole conversation, whereas a local context means one (typically embedded) clause. To illustrate, in (5) and (6) local contexts are antecedents of conditionals. [Stalnaker 1974] argued that during conversation, a global context is updated, which results in adding new assertions and new presuppositions to it. As he says, the hearer accommodates (takes for granted) the presupposition of the speaker's utterance. Later, [Heim 1983] pointed out that presuppositions can also project (or can also be accommodated) in local contexts. However, presupposition projection (or presupposition accommodation) in a global context is preferred over presupposition projection (or presupposition accommodation) in a local context (see [Beaver, Zeevat 2007] for an overview of literature on accommodation).

Turning back to the question of how to account for the difference between (5) and (6), according to Abusch, the answer is that the soft trigger *win* can project in a local context (but can also project in a global context), whereas the hard trigger *too* only projects in a global context.

The discussion of the two trigger categories has led to the following two controversial viewpoints. On the one hand, building upon [Chemla 2009], [Romoli 2011, 2014] presented further arguments in favour of the trigger dichotomy. His analysis relies upon the idea that, unlike hard triggers, soft triggers are pragmatically derived (that is, via pragmatic reasoning of the hearer) and bear resemblance to scalar implicatures. On the other hand, [Abrusán 2011, 2016] points out that triggers represent one conceptual and categorical phenomenon and the diversity among triggers can be captured by the interplay of several pragmatic and discourse factors such as focus-sensitivity, anaphoricity, and question-answer congruence. To illustrate, the triggers *too* and *again* are propositional anaphoric pronouns that seek their antecedents in the previous discourse. For example, the sentence *John read the article too* evokes a proposition about someone else having read the article ('x read the article') mentioned before; the sentence *John read the article again* evokes a proposition 'John read the article at t_1 ', where t_1 happened before the time of uttering the sentence. Things become more complicated if one takes into consideration the fact that the soft triggers under focus give rise to presupposition, cf. (7) and (8). In (7), the soft trigger *discover* is not focused and, therefore, does not project presupposition. However, in (8), it is focused and, therefore, does project presupposition.

- (7) *If the TA **discovers** that [your work is plagiarised]_F, I will be [forced to notify the Dean]_F.* [Abrusán 2016: 171]
- (8) *If the TA [**discovers**]_F that your work is plagiarised, I will be [forced to notify the Dean]_F.* [Abrusán 2016: 171]

So far, we have considered sentences with one presupposition trigger, or better to say, we have paid attention to only one presupposition trigger in a sentence. Let us now examine complex sentences with several triggers. What happens in (9)?

- (9) *Bill does not **know** that all of **Jack's children** are bald.* [Karttunen 1973: 172]

[Langendoen, Savin 1971] pointed out that the presuppositions of a whole sentence are a sum of all the presuppositions of its parts.

Accordingly, the sentence (9) has the presupposition that Jack has children as well as the presupposition that they all are bald. When a sentence is generated, the presuppositions are successively accumulated.

[Romoli 2014] also touched upon what he calls stacked soft triggers, cf. (10).

(10) *John stopped winning.* [Romoli 2014: 17]

He argued that each trigger generates its own presupposition via the exhaustification (EXH) operator that applies automatically to each trigger: EXH [stop[EXH[PRO winning]]]. This operator was originally introduced in [Chierchia 2006] to account for scalar implicature computation and is semantically close to the lexical item *only* (that is why sometimes it is called *Only*-operator or *O*-operator). It exhaustifies a set of alternatives for every lexical item that evokes alternatives.

Even though it seems to be an elegant technical solution to the triggering problem, it does not seem to be psychologically plausible. Abundant experimental evidence aggregated so far has revealed that the empirical picture of scalar implicatures is much more complicated than the mere application of this operator. In general, the interaction of several triggers has been paid little attention in the literature, and the present study aims at filling in this gap.

1.2. Experimental evidence for the diversity of presupposition triggers

Psycholinguistic evidence has overwhelmingly supported the distinction between soft vs. hard presupposition triggers in various languages, including [Xue, Onea 2012] in German, [Smith, Hall 2012; Jayez, Mongelli 2012] in English. The methods differed in the cited papers. [Xue, Onea 2012] used a verification task, that is, their participants were presented with utterances followed by questions. They had to evaluate whether the information conveyed by questions was consistent with the content of the utterances. [Smith, Hall 2012; Jayez, Mongelli 2012] used a speaker-oriented methodology. They evaluated participants' surprise

towards a given utterance. [Xue, Onea 2012] verified conditionals, [Smith, Hall 2012] tested assertions, negated assertions and conditionals, whereas [Jayez, Mongelli 2012] investigated two conditional contexts where one included an anaphoric pronoun while the other lacked it.

The presupposition triggers used in [Xue, Onea 2012] were German hard triggers *auch* ‘too’ and *wieder* ‘again’, soft triggers *wissen* ‘know’ and *erfahren* ‘find out’. [Smith, Hall 2012] tested the English hard trigger *it*-cleft and soft triggers *win* and *know*. [Jayez, Mongelli 2012] used the hard triggers *too* and *it*-cleft and the soft trigger *win*.

In [Xue, Onea 2012], participants were presented with sentence pairs: a conditional sentence and a question that contained a negated embedded clause. The non-negated counterpart was mentioned in the conditional. Cf. (11a)–(11b).

- (11) a. (Sentence) *Wenn Paul weiß, dass Christine gerne Tee trinkt, schenkt er ihr eine Teekanne.* [Xue, Onea 2012]
 ‘If Paul **knows** that Kristina likes drinking tea, he will give her a teapot as a present.’
- b. (Question) *Ist es möglich, dass Christine nicht gerne Tee trinkt?*
 [ibid.]
 ‘Is it possible that Kristina doesn’t like tea?’

The participants were to answer by choosing between *Ja, das ist möglich* ‘Yes, it is possible’, *Nein, das ist nicht möglich* ‘No, it is not possible’ or *Ich weiß es nicht* ‘I don’t know’. In [Smith, Hall 2012], each of the contexts (assertion, negation and conditional) was followed by three questions of which only one was the critical item, while the others were fillers. After reading the questions, the participants were to evaluate the degree of their surprise by a five-point scale. In [Jayez, Mongelli 2012], the participants were presented with only sentences without questions. They were to evaluate the degree of their surprise by a seven-point scale.

The results of the experimental studies were as follows. [Xue, Onea 2012] demonstrated diversity not only between hard and soft triggers but also among soft triggers. The soft trigger *wissen* received 38 %

of projection and the soft trigger *erfahren*, 52 % of projection, this difference being quite significant. Moreover, the distinction between *erfahren* and the hard triggers *auch* and *wieder* also was significant. The latter two received 87 % and 99 % respectively. The hard triggers, however, did not show significant results. [Smith, Hall 2012] revealed a difference only between soft triggers and one hard trigger, but not within soft triggers. Finally, [Jayez, Mongelli 2012] demonstrated difference between the soft trigger *win* and the hard triggers *too* and *it*-cleft.

At the same time, the dichotomy between the two categories of triggers is still debated as some experimental investigations found a rather blurred distinction between soft vs. hard triggers (cf. [Jayez et al. 2015] who tested French hard trigger *aussi* ‘too’ and clefts as well as the soft trigger *regretter* ‘regret’).

[Amaral et al. 2012; Cummins et al. 2012; Tonhauser et al. 2018; Tonhauser et al. 2019] a.o. pointed out that presupposition triggers are divergent with respect to their contribution to at-issue vs. non-at-issue content of utterance. Even though we do not consider this aspect of presupposition projection in the experimental part of the paper, we find it relevant to mention it here. [Amaral et al. 2012; Cummins et al. 2012; Tonhauser et al. 2018; Tonhauser et al. 2019] a.o. also tested soft and hard triggers, though not in the contexts of Family of Sentences. The participants were presented with dialogues that consisted of assertions with presupposition triggers uttered by one speaker and confirmations or contradictions uttered by another speaker. [Tonhauser et al. 2018] hypothesised that presupposition projection depends on whether the presupposition trigger belongs to a non-at-issue content of the utterance. [Tonhauser et al. 2018] formulated the *Gradient Projection Principle*: if a presupposition trigger belongs to the at-issue content of the utterance, presupposition is not likely to project; on the contrary, if a presupposition trigger belongs to the non-at-issue content of utterance, the presupposition is likely to project. Therefore, presupposition is regulated not only by the lexical information of a trigger, but also by a discourse factor called Question Under Discussion (QUD). QUD helps determine which information is in the focus of an utterance and which information is in its background.

Consider the utterance *The friends found out that the play had been cancelled*. The QUD for this sentence will be *Did the friends find out that the play had been cancelled?* The answer “Yes, the friends found out...” is felicitous and, therefore, it reveals the focus of the utterance, and the answer “Yes, the play had been cancelled” is infelicitous and, therefore, indicates the background of the utterance. In addition, [Tonhauser et al. 2018] demonstrated variation between hard and soft triggers as well as within each group of triggers.

1.3. Hypotheses of the present study

It is important to emphasise that, to the best of our knowledge, verification of presupposition triggers in embedded clauses as well as their interaction in main and embedded clauses have never been experimentally studied so far.

Recall that, according to [Heim 1983], global projection, i.e., projection in a global context, is preferred over local projection, i.e., projection in a local context. The reviewer drew our attention to the fact that this preference is operative only in embedded contexts where there are both options (local and global projection), whereas in main contexts, there is only the global projection option. Heim’s preference may explain why projection is so widespread from embedded contexts. The question is whether the distinction between hard and soft triggers is sensitive to presupposition projection in clauses embedded under some matrix verbs.

The hypotheses of the present study are formulated below.

Hypothesis 1: There should be a distinction between main vs. embedded contexts in terms of the two trigger types (soft vs. hard): the main clause facilitates presupposition projection to a greater extent than the embedded clause. By embedded contexts we mean clauses embedded under attitude verbs (*zabyt* ‘forget’; cf. [Heim 1992]), reporting verbs (e.g., *govorit* ‘say’), and emotive verbs (e.g., *rasstroitsya* ‘get upset’). The hypothesis is motivated by the fact that embedded contexts show variability in either global or local projection, whereas there is no option of local

projection in main clause contexts. Therefore, we predict to have a distinction between soft vs. hard triggers in embedded clause contexts and a lack of it in main clause contexts. The hypothesis is viewed as an extended possibility of the standard theory of soft vs. hard triggers that involves entailment-cancelling contexts.

Hypothesis 2: This hypothesis partially follows from Hypothesis 1 and is two-fold: (i) rates of presupposition projection of a trigger in the main clause regarding a trigger in the embedded clause and (ii) rates of presupposition projection of a trigger in the embedded clause regarding a trigger in the main clause. Expectation (i) was tested in the first experimental list and implied a question to a trigger in the main clause. It suggested the following relative order of rates of presupposition projection: hard triggers in both clauses, a hard trigger in the main clause and a soft trigger in the embedded clause >> a soft trigger in the main clause and a hard trigger in the embedded clause, soft triggers in both clauses. Expectation (ii) was tested in the second experimental list and implied a question to a trigger in the embedded clause. It suggested the following relative order of rates of presupposition projection: hard triggers in both clauses, a soft trigger in the main clause and a hard trigger in the embedded clause >> a hard trigger in the main clause and a soft trigger in the embedded clause, soft triggers in both clauses. A reason behind Hypothesis 2 is that, as stated previously, hard triggers are expected to give rise to more presuppositions than soft triggers in both types of (main and embedded) clauses.

Hypothesis 3: There *might* be a distinction between single triggers and double triggers, that is: (i) a single soft trigger in the main clause vs. a soft trigger in the main clause and a soft/hard trigger in the embedded clause; (ii) a single soft trigger in the embedded clause vs. a soft/hard trigger in the main clause and a soft trigger in the embedded clause; (iii) a single hard trigger in the main clause vs. a hard trigger in the main clause and a hard/soft trigger in the embedded clause; and (iv) a single hard trigger in the embedded clause vs. a hard/soft trigger in the main clause and a hard trigger in the embedded clause. We do not have a strong motivation for this hypothesis (hence the modal *might* above), but it seems interesting to be tested for a probable effect.

2. Experiment

2.1. Participants

66 Russian native speakers recruited via Yandex.Toloka participated in the experiment, their age ranging from 18 to 63 years, with a mean age of 36 years, 28 females and 38 males. The participants were paid \$1.5 for their work. See *Section 2.3* for the data used for statistical analyses.

2.2. Methods

The experiment was designed as a verification task, that is, participants, presented with utterances followed by questions, were to evaluate the information conveyed by questions according to the information conveyed by utterances. This method is similar to the one used by [Xue, Onea 2012] and was chosen here because the results obtained can be compared to those by [Xue, Onea 2012].

The following six presupposition triggers were experimentally tested: the adverbs *opyat* and *sнова* ‘again’, the particle *tozhe* ‘too’, the attitude verbs *uznat* ‘find out’, *zabyt* ‘forget’ and the aspectual verb *zakonchit* ‘finish’. According to the original paper by [Abush 2010] as well as to [Xue, Onea 2012; Smith, Hall 2012; Jayez, Mongelli 2012], the adverbs and the particle belong to hard triggers, while the verbs represent soft triggers. The attitude verbs *uznat* ‘find out’ and *zabyt* ‘forget’ were used with an embedded clause. Additionally, the verb *uznat* ‘find out’ was used with a prepositional phrase with *o(b)* ‘about’. Moreover, the verb *zabyt* ‘forget’ was used with an infinitive, i.e., as an implicative verb that also derives a presupposition [Beaver 2011/2021]. The verb *zakonchit* was used with an imperfective infinitive. The presuppositions of soft triggers were made similar to each other, namely they all were pre-state presuppositions. Remarkably, for the verb *zabyt*, the utterance to evaluate contained a perfective infinitive, whereas the question

included an imperfective verb form. This was done intentionally, to refer to a pre-state presupposition.

The interaction of hard and soft triggers was verified in an assertive sentence that consisted of a main clause and an embedded clause with the complementiser *chto* ‘that’. There were 4 types of sentences: a hard trigger in the main clause and a soft trigger in the embedded clause (see (12a)–(12c)), a soft trigger in the main clause and a hard trigger in the embedded clause (see (13a)–(13c)), a hard trigger in the main clause and a hard trigger in the embedded clause (see (14a)–(14c)), a soft trigger in the main clause and a soft trigger in the embedded clause (see (15a)–(15c)). Six sentences were compiled for each sentence type, resulting in 24 experimental critical sentences in total. The following combinations were used in critical sentences: 6 combinations of hard + soft triggers (*opyat* + *zabyt*, *tozhe* + *zabyt*, *snova* + *uznat*, *tozhe* + *uznat*, *opyat* + *zakonchit*, *tozhe* + *zakonchit*), 6 combinations of soft + hard triggers (*zabyt* + *snova*, *zabyt* + *tozhe*, *uznat* + *opyat*, *uznat* + *tozhe*, *zakonchit* + *snova*, *zakonchit* + *tozhe*), 6 combinations of hard + hard triggers (*tozhe* + *snova*, *tozhe* + *opyat*, *opyat* + *tozhe*, *snova* + *tozhe*, *opyat* + *snova*, *snova* + *opyat*), and 6 combinations of soft + soft triggers (*zabyt* + *uznat*, *uznat* + *zabyt*, *uznat* + *zakonchit*, *zakonchit* + *uznat*, *zakonchit* + *zabyt*, *zabyt* + *zakonchit*).

Each critical sentence was followed by a modal question that violated the presupposition of either the main or the embedded clause. This yielded 48 sentence-question pairs.

Hard trigger in main clause + soft trigger in embedded clause

- (12) a. *Mama opyat govorila, chto deti zabyli sobrat svoi igrushki v komnate.*
 ‘Mother said **again** that the children had **forgotten** to collect their toys in the room.’
- b. *Mozhet li takoe byt, chto mama govorila ob etom vpervye?*
 ‘Is it possible that mother said that for the first time?’
- c. *Mozhet li takoe byt, chto deti ranshe ne pomnili ob etom?*
 ‘Is it possible that the children did not remember about that before?’

Soft trigger in main clause + hard trigger in embedded clause

- (13) a. *Alina **uznala**, chto Sasha **opyat** poshyol s druziyami v kino.*
 ‘Alina **found out** that Sasha had gone to the cinema with his friends **again**.’
- b. *Mozhet li takoe byt, chto Alina ranshe eto znala?*
 ‘Is it possible that Alina knew about that before?’
- c. *Mozhet li takoe byt, chto Sasha ranshe ne khodil s druziyami v kino?*
 ‘Is it possible that Sasha did not go to the cinema with his friends before?’

Hard trigger in main clause + hard trigger in embedded clause

- (14) a. *Mitin drug Danya **opyat** skazal, chto on **tozhe** plokho sebya chuvstvoval.*
 ‘Mitya’s friend Danya said **again** that he did not feel well **either**.’
- b. *Mozhet li takoe byt, chto Danya ranshe etogo ne govoril?*
 ‘Is it possible that Danya did not say that before?’
- c. *Mozhet li takoe byt, chto bolshe nikto iz Mitinykh druzey plokho sebya ne chuvstvoval?*
 ‘Is it possible that none of Mitya’s friends felt bad?’

Soft trigger in main clause + soft trigger in embedded clause

- (15) a. *Petya **uznal**, chto Ira **zabyla** zaryadit telefon.*
 ‘Petya **found out** that Ira had **forgotten** to charge her phone.’
- b. *Mozhet li takoe byt, chto Petya ranshe znal ob etom?*
 ‘Is it possible that Petya knew about it before?’
- c. *Mozhet li takoe byt, chto Ira ranshe ne pomnila ob etom?*
 ‘Is it possible that Ira did not remember about that before?’

We used two experimental lists where both included all experimental critical items, with one containing questions to the main, and the other,

to the embedded clause. The task was to answer each question by either “yes” or “no”.

Apart from the critical items, the lists included 24 control sentences. These also contained soft or hard triggers in the main or embedded clauses. This yielded four types of controls (see ((16a)–(19c) for each type) with six sentences in each. However, they had only one trigger in either the main or embedded clause. The control sentences were followed by questions about the information in the main clause in the first experimental list and about the information in the embedded clause in the second experimental list.

Soft trigger in main clause

- (16) a. *Ira **zabyla**, chto v ponedelnik u nee nachinaetsya otpusk.*
 ‘Ira **forgot** that on Monday her vacation would start.’
- b. *Mozhet li takoe byt, chto Ira ranshe ne pommila ob etom?*
 ‘Is it possible that she did not remember that before?’

Soft trigger in embedded clause

- (17) a. *Podruga rasskazala, chto **zakonchila** delat remont.*
 ‘My friend said that she had **finished** doing the repairs.’
- b. *Mozhet li takoe byt, chto podruga ne delala remont?*
 ‘Is it possible that my friend did not do the repairs?’

Hard trigger in main clause

- (18) a. *Papa **opyat** skazal, chto neznakomets khodil u nashego doma.*
 ‘Daddy said **again** that the stranger was wandering around our house’.
- b. *Mozhet li takoe byt, chto papa ranshe ne govoril ob etom?*
 ‘Is it possible that daddy did not say that before?’

Hard trigger in embedded clause

- (19) a. *Mishin drug poshutil, chto ego **tozhe** priglasili na vecherinku.*
 ‘Misha’s friend said jokingly that he had been invited to the party **as well**.’

- b. *Mozhet li takoe byt, chto bolshe nikogo iz Mishinykh družey ne priglašali na večerinku?*
 ‘Is it possible that none of Misha’s friends was invited to the party?’

Finally, the experiment comprised 40 filler sentences consisting of one-clause assertives, identical in both experimental lists. 21 of these sentences were followed by a question that duplicated the information conveyed by the sentence in order to prompt the “yes” answer. The other 19 were followed by a question that contradicted the information in the sentence and was meant to provoke the “no” answer, cf. (20a)–(21b).

True filler

- (20) a. *Nebolshoy gorod nakhoditsya u morya.*
 ‘A small town is located near the sea.’
 b. *Mozhet li takoe byt, chto gorod primorskiy?*
 ‘Is it possible that the town is by the seaside?’

False filler

- (21) a. *Ryukzak visit na stule v komnate.*
 ‘The backpack is on the chair in the room.’
 b. *Mozhet li takoe byt, chto ryukzak ne v komnate?*
 ‘Is it possible that the backpack is not in the room?’

Each of the two experimental lists included 24 critical sentences, 12 control sentences and 40 fillers, with all sentences randomised. One list included questions targeting the main clause content, and the other list comprised questions targeting the embedded clause content. One list was answered by 34 participants, and the other one was answered by 31 participants. The experiment was conducted on the Internet platform Yandex.Toloka created specifically for crowdsourcing projects, including online experiments. Before the test, the participants were presented with the following instruction: “This experiment targets only Russian native speakers. The experiment consists of sentences and questions to them. You need to read each sentence and answer the question

choosing either “yes” or “no”. Don’t rush, take your time and read the questions attentively. No special knowledge is required to participate in the experiment.”

2.3. Results

In total, 5016 responses from 66 participants were received: 2640 responses to filler items, 792 responses to control items, and 1584 responses to critical items. The answers from 24 participants had to be excluded. Of these, 21 participants had replied to the fillers with less than 20% accuracy and 3 participants had filled out a questionnaire twice (thus only the first entries were used for statistical analyses). This yielded responses from 21 participants for one list and from 21 participants for the other list, bringing it to 1008 responses for critical items and 504 responses for control items (1512 answers for both groups of items).

If a participant selected the answer “yes”, this suggested that according to her/him, the presupposition was not projected in a given context. In contrast, if a participant selected the answer “no”, this meant that, according to her/him, the presupposition to be projected in a given context.

In what follows, we present figures and statistical results for the comparisons drawn between each group of critical items. Using R (R Core Team 2020), we performed logistic regression (lme4 package; Bates et al. 2015). In the tests reported here, random intercepts were included for participants and sentences.

We start with the distribution of answers for single hard and single soft triggers in two syntactic positions. The results are displayed in *Figure 1*. Recall that single hard and soft triggers in main clauses were used in the first experimental list and single hard and soft triggers in embedded clauses were used in the second list.

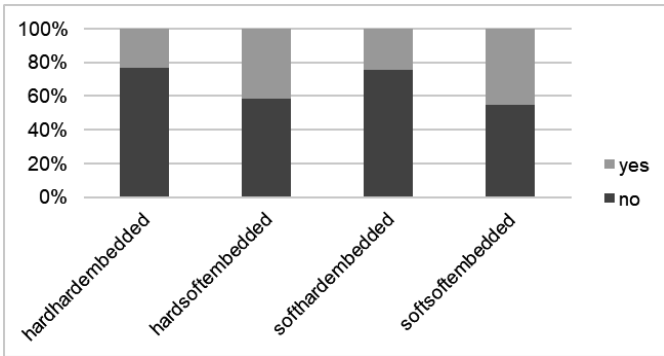


Figure 1. Distribution of “yes” / “no” answers in main vs. embedded clauses with a single (hard or soft) trigger (across the exp. lists)

Logistic regression showed significant difference between hard triggers in embedded clauses and soft triggers in embedded triggers ($\beta = 2.2596, SE = 1.0157, Z = 2.225, p = 0.0261$). The other differences were not significant. These results confirm Hypothesis 1.

Let us now consider hard and soft triggers separately regarding their syntactic (main vs. embedded) position. *Figure 2* presents the distribution of hard triggers in main clauses in the 1st experimental list where questions addressed hard triggers in the main clause.

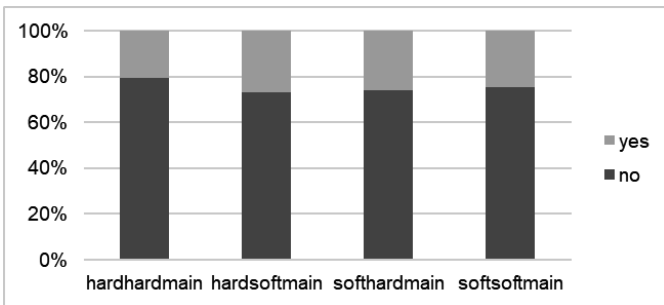


Figure 2. Distribution of “yes” / “no” answers for hard triggers in main clauses in the 1st exp. list (the questions addressed hard triggers in the main clause)

Logistic regression demonstrated no significant difference between any two types of the triggers ($p > 0.05$).

Now let us have a look at hard triggers positioned in embedded clauses in the 2nd experimental list. The results are visualised in *Figure 3*.

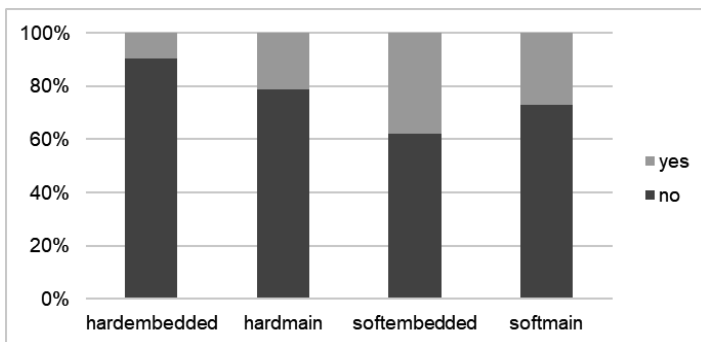


Figure 3. Distribution of “yes” / “no” answers for hard triggers in embedded clauses in the 2nd exp. list (the questions addressed hard triggers in the embedded clause)

Logistic regression demonstrated no significant difference between any two types of the triggers ($p > 0.05$).

Figure 4 illustrates the results obtained for soft triggers in main clauses in the 1st experimental list.

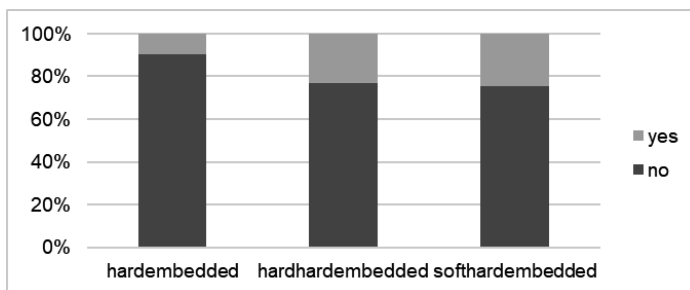


Figure 4. Distribution of “yes” / “no” answers for soft triggers in main clauses in the 1st exp. list (the questions addressed soft triggers in the main clause)

Logistic regression demonstrated no significant difference between any two types of the triggers ($p > 0.05$).

Figure 5 visualises the findings for soft triggers placed in embedded clauses in the 2nd experimental list.

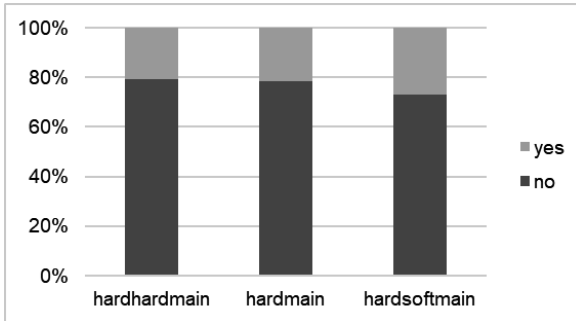


Figure 5. Distribution of “yes”/“no” answers for soft triggers in embedded clauses in the 2nd exp. list (the questions addressed soft triggers in the embedded clause)

Logistic regression demonstrated no significant difference between any two types of the triggers ($p > 0.05$).

The data presented in Figures 2–5 does not support Hypothesis 3.

Let us now consider interactions between two triggers for each experimental list, i.e., the percentages for the projection of a matrix trigger in the context of an embedded trigger. The interactions between two triggers from the 1st experimental list are given in Figure 6.

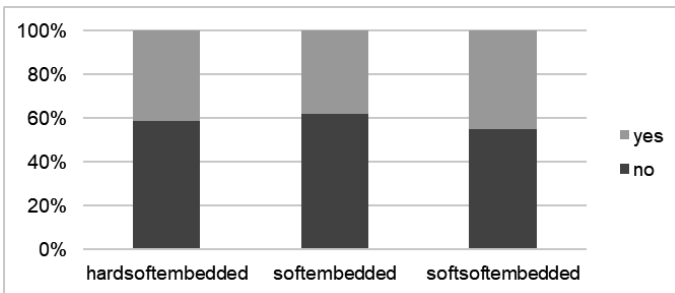


Figure 6. Distribution of “yes”/“no” answers for two triggers in the 1st exp. list (the questions addressed triggers in the main clause)

Logistic regression demonstrated no significant difference between any two types of the triggers ($p > 0.05$).

The interactions between two triggers from the 2nd experimental list are given in *Figure 7*.

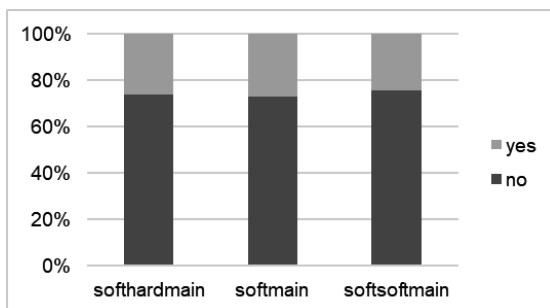


Figure 7. Distribution of “yes”/“no” answers for two triggers in the 2nd exp. list (the questions addressed triggers in the embedded clause)

Logistic regression demonstrated no significant difference between any two types of the triggers ($p > 0.05$).

The data presented in *Figures 6–7* does not confirm Hypothesis 2. However, we see that *Figure 7* suggests some potential variation between soft vs. hard triggers in embedded contexts in contrast to *Figure 6*.

2.4. Discussion

The present study revealed a distinction between hard and soft triggers in clauses embedded under some attitude, reporting, or emotive verbs. This is an interesting result since it demonstrates sensitivity of the two types of triggers to assertive embedded contexts where both local and global projection options are available. It suggests that the studied embedded contexts facilitate global projection of hard triggers to a greater extent than that of soft triggers. Therefore, clauses embedded under (at least) some verbs represent yet another type of contexts along with the survival contexts that show a distinction between soft vs. hard triggers.

Moreover, since [Abusch 2002, 2010], the two categories of triggers have theoretically and experimentally been studied in various embedded contexts, i.e., under the scope of some semantic operators that constitute the Family of Sentences (cf. *Sections 1.1* and *1.2*). Main clause assertive contexts have not received much attention so far as they typically project presupposition (however, see [Tiemann et al. 2011]). The present study reveals that even hard triggers do not project to 100 % in main clause assertive contexts. This is unpredicted from the perspective of any existing theory. Interestingly, in [Xue, Onea 2012], the data obtained for hard triggers in the conditional antecedent also fell under 100 %. Why is that? We are not sure if an answer to this question is readily available on the market. One plausible reason may be that hard triggers are purely semantic by nature. Our results suggest that there might exist some other (pragmatic) factors that also play a role. Another plausible reason is that the (syntactic and semantic) complexity of sentences might have impeded processing at some stage. This follows from the fact that even some logical operations are not always agreed upon in human reasoning. Take for example *modus tollens*, a variety of syllogistic reasoning. Despite its logical nature, people are subject to fallacies while drawing logical inferences [Evans, Handley 1999; Oaksford et al. 2000]. Its structural representation is as follows: If p , then q AND not q ; THEREFORE, not p . To illustrate, ‘If there was a strong wind, leaves in the park are on the ground’ AND ‘Leaves in the park are not on the ground’, THEREFORE, ‘there was not a strong wind’. It is also important to stress that our data is not noisy. The data selected for the statistical analyses in *Section 2.3* has a good quality since its level of filler accuracy is relatively high (more than 80 %). Moreover, even those participants, who made no mistakes in fillers, i.e. showed 100 % filler accuracy, gave “yes”-responses to some of the critical and control items.

The present study also verified embedded clauses. According to [Langendoen, Savin 1971], presuppositions projected in embedded clauses are accumulated through sentence derivation, that is, presuppositions of a whole sentence are a sum of presuppositions of its parts. Our data does not support this view given the distinction between soft vs. hard triggers in embedded clauses and the fallacies in pragmatic reasoning. Our data does not accord with the scalar implicature view proposed

by [Romoli 2014] either. The presuppositions that we observe in the present study are not generated automatically, via application of the exhaustification operator. We see variation in presupposition projection among the presupposition triggers and among the contexts they are used in. Such variation seems to be problematic for the automatic generation account.

Even though no robust (statistically confirmed) effect has been received for the data presented in *Figure 7*, we may observe the contrast between hard vs. soft triggers in embedded contexts where more experimental data is involved. In *Figure 7*, there are around 75 % answers of presupposition projection for hard triggers vs. less than 60 % answers of presupposition projection for soft triggers. An explanation may be that, as said before, in embedded contexts, both local and global projection options are available, and some soft triggers may undergo local projection. Additional evidence comes from the comparison between the data of *Figure 7* and the data of *Figure 6*, with higher rates of presupposition projection attested in main clause contexts (75–80 % of the answers).

3. Conclusion

The present study provides experimental evidence for the categorical distinction between hard and soft triggers in clauses embedded under some attitude, reporting, and emotive verbs. Furthermore, the study shows that presupposition projection is not an automatically generated process even for hard triggers in main clause contexts due to fallacies in pragmatic reasoning that might be caused by (syntactic and semantic) complexity of sentences. The paper also investigates single triggers and pairs of triggers for the first time. This opens a new perspective on studying triggers.

Appendix

Here is a link to the folder with the experimental materials:
<https://osf.io/cqr78/>

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