Focus effect story of relative clause extraposition*

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Lee, Seung Han. 2022. Focus effect story of relative clause extraposition. *Linguistic Research* 39(3): 519-546. This study proposes that relative clause extraposition (hearafter RCE) is employed to produce stronger focus effect (i.e., pitch increase) on main predicate, thus delivering speaker′s illocutionary acts more remarkably. At first glance, data of relevance here drawn from BYU-BNC, COCA, and Buckeye Speech Corpus provide us with a principal finding that not only is the heaviest weight of relative clause likely to be one trigger for extraposition, but discourse-based RCE is also classified into four types under the assumption of extraposed relativizer as cohesive device. More to the point, we highlight the duration of silent pause occurring in the hitatus between main predicate and extraposed relative pronoun in order to prove discontinuous structure of RCE. Unexpectedly, the length of silent pause decreases when the information on extraposed relative clause loads more than thirteen words. This idiosyncratic behavior leads us to assume that focus effect determiners are hierarchically ordered and also their combinations are ranked according to different degrees of focus effect. It is thus no coincidence that extraposition of relative clause is highly favored over its canonical construction, thereby rendering focus effect more salient. We go a step further in claiming that focus cohesion principle provides a plausible explanation for the decreasing pause duration of RCE with the help of one questionnaire survey. Suffice to say, focused main predicate of RCE hauls its neighboring constituent, thereby leading to collapse of grammatical device, decrease of pause duration, and even misunderstanding of utterance. **(Chodang University)**

1. Introduction

English sometimes allows variability in the area preceded by main verb even though it has relatively fixed word order (Wasow 2002). One variation of English structures is when restrictive relative clause detached from head noun is extraposed at the final

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position of a sentence, thereby resulting in discontinuous noun phrase (Quirk et al. 1985). Such relative clause extraposition (hereafter RCE) is identified in the following corpus data:

(1) a. **Some individuals** have come out **who** claim they are among the 3,400 duped voters.   (COCA 2000)

   b. **Some smoke detectors** are available **that** resemble tree decorations.

   (COCA 1990)

   c. **No studies** could be found **that** consider gender differences. (COCA 2007)

   d. I do expect **some decisions** to be made **that** increase the pressure.

   (COCA 1993)

Restrictive relative clause is separated from its head noun, and then main predicate resides between two constituents, thus violating X-bar rule.[1] This property of RCE is structured as a simple template:

(2) NPj[subject]+VP+NPi[relativizer]+Extraposed relative clause[GAP <NPi>]

Subject NP is given a theta role indexed with j, and main predicate encompasses finite tense as well as *to*-infinitive. As well, extraposed relative clause is discharged with a filler NPi (i.e., relativizer). This template can distinguish RCE from other seemingly similar structures:

(3) a. The evidence mounts that the national park is being driven towards ecological collapse.   (BYU-BNC 1991)

   b. Some smoke detectors that resemble tree decorations are available.

   c. My friends are people that I trust.   (BYU-BNC 1991)

   d. It was assumed that the teachers answered all written and oral questions honestly.   (COCA 2015)

These are totally different from RCE for several reasons. In (3a) there is no gap within extraposed clausal complement, whereas main predicate in (3b) does not precede

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1   A complement or modifier should come into existence within the identical maximal projection with its head (Kim and Sells 2008).

extraposed relative clause. *People* in (3c) is interpreted as head noun for its following modifier. For the case of sentential subject extraposition like (3d), semantically dummy *it* and extraposed clausal complement with no gap lead the structure not to be licensed as RCE construction.

Several factors have been suggested as plausible triggers for extraposition of relative clause. One of them is that the grammatical weight of relative clause plays a significant role in RCE (Quirk et al. 1985; Wasow 2002; Francis and Michaelis 2017). Göbbel (2013) claims that extraposition is employed to form focus construction. As well, extraposition facilitates language processing and production planning (Arnold et al. 2000). Taken together, this paper delves into extraposition phenomenon in the light of focus effect (i.e., pitch increase). Very little study of focus effect undertaken here has been introduced in previous studies, so this perspective will become a starting point to provide a plausible answer to extraposition of relative clause. That is, extraposition is here assumed to be employed to produce stronger focus effect on main predicate, through a series of two experimental investigations and one questionnaire survey. As a starting point, we briefly introduce the grammatical properties and discourse-based classification of RCE with the help of corpus data collected from BYU-BNC, COCA, and Buckeye Speech Corpus. In Section 3, we highlight the duration of silent pause occurring in the hiatus between the ending point of main predicate and the beginning point of extraposed relativizer in order to prove the discontinuous structure of RCE, but one experimental study yields an unexpected result that heavier weight of extraposed relative clause lies in the decreasing duration of silent pause. Subsequently, our concern moves to establish several principles in order to answer the idiosyncratic behavior of silent pause through the other experimental investigation in Section 4: hierarchy of focus effect determiners, focus effect table, focus maximum principle, and focus cohesion principle. In other words, extraposition is triggered by speaker′s desire to produce stronger focus effect on main predicate in order to deliver their illocutionary acts more remarkably. Last, we conduct a questionnaire survey to prove focus cohesion principle which provides a principled explanation for focus effect as well as the decreasing pause duration; a focused element tends to merge as many adjacent elements as possible within its specific phrase boundary, thereby driving speakers to ignore extraposed relativizer, decrease the duration of silent pause, and even encounter difficulties in understanding utterance.

2. Corpus findings

2.1 Grammatical properties

With purpose of better grasping the grammatical properties of RCE, we extract a total of 597 instances of RCE from Brigham Young University-British National Corpus (BYU-BNC) and Corpus of Contemporary American English (COCA): 341 sentences from COCA and 256 ones BYU-BNC.[2] Our corpus findings are substantially in accordance with Lee and Uhm (2017) and Lee (2017). The most common main predicate is passive voice (84.09%, n=502) as in (1c), whereas presentative intransitive (11.89%, n=71) as in (1a) ranks as the secondary place, which denotes intransitive verb introducing the concept related to existence or appearance, or indicating the referent of subject NP (Francis and Michaelis 2014). Only a small portion of adjective (4.02%, n=24) as in (1b) functions as predicative complement of copula be. As well, main predicate of RCE holds external argument featured with [AGENT -], implying that verb-biased tendency comes into existence in RCE.

Also of interest is whether the grammatical weight of extraposed relative clause is a plausible trigger for extraposition. Following Francis and Michaelis (2017) which prefers word-based measure to length in syllable, extraposed relative clause (mean 11.27 words) has the inclination to load heavier weight than subject (mean 2.26 words) and main predicate (mean 2.64 words), thus serving to increase the probability of satisfying Wasow's (2002) PEW.[3] This finding goes in tandem with Huddleston and Pullum's (2002) study that RCE is most likely to occur when extraposed relative clause becomes heavier than subject. More to the point, Francis and Michaelis (2017) claims that RCE is favored over its canonical construction when the grammatical weight of main predicate is lighter and that of restrictive relative is heavier.

2.2 Discourse-based classification

In keeping with Lee's (2017) observation, we assume the role of extraposed relative pronoun as cohesive device, thereby classifying the information structure of RCE into

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2   BYU-BNC contains 100 million words of British English whereas COCA introduces 410 million words of American English. They provide the spoken and written English, being freely available online.

3   Principle of End Weight (PEW): Phrases are in order of increasing weight (Wasow 2002).

four categories. The discourse status of subject NP and extraposed relative clause is respectively encoded with the help of prior background and context. In other words, two information labels for antecedent and its extraposed modifier are classified into Discourse-New (i.e., no background information) or Discourse-Old (i.e., prior context). The constituent with no prior context of the referent itself is defined as Discourse-New, whereas the item identified within background of the preceding text is named as Discourse-Old. At first glance, we propose that extraposed relative pronoun functions as cohesive device. As one of cohesive devices, reference (e.g., pronoun, demonstrative, or comparative) denotes the item or person mentioned within a succeeding (cataphoric) and a previous (anaphoric) context (Halliday and Hasan 1976). In this respect, extraposed relativizer also shows the same behavior in that it ties subject NP to the background information introduced within postposed relative clause:[4]

(4) a. The back of the case is raised slightly **which** tilts the tablet to form a
        convenient drawing surface.   (BYU-BNC 1985-1994)
    b. The back of the case is raised slightly [Ø] tilts the tablet to form a
        convenient drawing surface.

As in (4a), extraposed relativizer leads readers to connect antecedent NP with its extraposed relative clause, whereas null pronoun as in (4b) makes them distracted about event order. Event process in (4a) has the order that the tilting event precedes the raising event, but for the case of (4b) the tilting event follows the raising event. This light tells us that extraposed relative pronoun functions as cohesive device, which gives readers a right path into event interpretation and subsequently offsets the long distance between head NP and its extraposed relative clause. One thing to notice here is that relativizer of canonical construction should not be considered as cohesive device:

(5) a. The back of the case **which** tilts the tablet to form a convenient drawing
        surface is raised slightly.

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4   Kiss (2005) claims that extraposition has anaphoric relation. In particular, restrictive relative clause
    semantically chooses its antecedent although modifier and modified element are not adjacent. When the index
    of antecedent NP is identical with that of extraposed relative clause, the information on extraposed relative
    clause becomes integrated with the content of head NP. In addition, antecedent and its relative pronoun should
    be compliant with respect to the identification of index because the relative pronoun obligatorily needs the
    antecedent to receive an interpretation.

b. (**That**) The back of the case [**Ø**] tilts the tablet to form a convenient drawing surface is raised slightly.

Although we delete relative pronoun as in (5a), head noun and its modifier can be treated as noun clausal argument as in (5b). Not surprisingly, both (5a) and (5b) have the same event order that the tilting event precedes the raising event. Overall then, extraposed relativizer is considered to be cohesive device in RCE.

With stand of the assumption, we here provide discourse-based classification of RCE. As a starting point, when antecedent NP and its extraposed relative clause are fully traced from prior information or evoked from preceding lines, it is categorized as Discourse-Old-Old-RCE (5.19%, n=31):

(6) Minimize the danger from a **Christmas tree** by keeping it wet, turning the **lights** off during the day and before you go to sleep, and by putting a **smoke detector** near it. Some **smoke detectors** are available that resemble **tree decorations**.   (COCA 1990)

Head noun of RCE as in (6) is inferable from preceding text: *smoke detector*. As well, the information on extraposed relative clause is associated with *Christmas tree* and *lights* introduced earlier. In what follows, Discourse-Old-New-RCE (4.86%, n=29) lies in where the information on extraposed relative clause is not identified from preceding lines, whereas only head noun is inferred from prior context:

(7) When these emotional strategies cannot be used, then the FEASP-approach does not make any sense in educational practice and related research. Is there a relation between the application of **the FEASP-strategies** and the experience of certain types of emotions during instruction? .. The effectiveness of **the FEASP-strategies** is an important issue for instructional designers, because in instructional practice **only those strategies** will be used that significantly help to **solve practical problems**.   (COCA 2001)

Antecedent NP of RCE as in (7) is evoked from prior lines: *the FEASP-strategies*. However, extraposed relative clause holds the information with no prior mention of background about *solving practical problems*. The type to be addressed next is

Discourse-New-Old-RCE (61.31%, n=366) where only extraposed relative clause has discourse-old information:

(8) Additionally, **girls are more empathic than boys**, which may explain their greater sensitivity to the quality of the interparental relationship. For instance, **adolescent girls have been found to be more accurate perceivers of marital conflict**. However, pertaining to the reverse effect of children on marriage, **no studies** could be found that consider **gender differences**.   (COCA 2007)

Subject (i.e., *no studies*) as in (8) is not identified from prior context. On the other hand, *gender differences* within extraposed relative clause is described from preceding lines. Last of all, when antecedent NP and its extraposed relative clause are all discourse-new, it is classified as Discourse-New-New-RCE (28.64%, n=171):

(9) The question remains whether reports such as these preach to the already converted, or if they can actually change people's attitudes. It may be useful to learn who is the actual audience of these reports and how they respond to them. Possibly **a web page** could be established that encourages **readers' interaction and discussion of the research reports**.   (COCA 1998)

As in (9), there is no prior information and background to facilitate the understanding of head NP and extraposed modifier. Considering this classification of RCE, Discourse-New-Old-RCE has the highest frequency overall while Discourse-New-New-RCE occupies the secondary status. This finding opens up the possibility that RCE is more likely to deliver discourse-new information within subject NP and put discourse-old content within extraposed relative clause.

3. Perspective on silent pause

3.1 Previous studies on pause

   Of particular relevance for our purpose here is a story about silent pause occurring in the hiatus between the ending point of main predicate and the starting point of

extraposed relative pronoun. On this close examination, we entail the following questions: Does the heavier weight of extraposed relative clause show more distinctive discontinuous syntactic structure between main predicate and extraposed relativizer?, How does the respective silent pauses of RCE and non-RCE behave?. In doing so, we start with Maclay and Osgood's (1959) observation that there are four hesitation types in spontaneous English speech: filled pause, false start, repeat, and unfilled pause. Unfilled pause (i.e., silent pause) is accompanied with silence of no phoneme and unusual length, delivering the uncertainty about lexical words to some degree (Goldman-Eisler 1961).

Duez (1985) syntactically analyzes the perception of silent pause in normal speech, inverted speech, and synthetic speech in French, thereby claiming that length of silent pause is strongly associated with syntactic structure. In other words, a between-clause and between-constituent status tends to be easily identified with the help of pause duration. Accordingly, the silent pause residing at syntactic boundary is particularly striking because it well designates syntactic structure. The longer silent pause length is, the more highly syntactic structure is evident. In a similar vein, if words or phrases are strongly correlated each other, the duration of silent pause should be minimal in between, whereas the silent pause occurring between loosely associated constituents should have longer duration (Rochester 1973). As well, Cowan and Bloch (1948) observes that silent pause enables the constituents of sentence to be grouped into syntactic units. Sentence-final pause has longer duration than any other pauses within identical sentence. The weight of syntactic unit being related to pause duration prosodically triggers its isolation from the rest of sentence. Along the same line, the gaps for breathing in speech production exclusively correlated to syntactic structures are as follows (Goldman-Eisler 1958):

(10) a. At natural punctuation points (i.e., the end of a sentence)
　　 b. Immediately preceding a conjunction (e.g., coordinators and subordinators)
　　 c. Before relative and interrogative pronouns (e.g., *who*, *which*, *what*, *why*, *whose*)
　　 d. When a question is indirect or implied (e.g., *I don't know whether I will*)
　　 e. Before all adverbial clauses of time (e.g., *when*), manner (e.g., *how*), and place (e.g., *where*)

If breath fills up one of the gaps of conditions as in (10), the gap definitely implements its duty to indicate grammatical juncture. Once again, this implies that silent pause is

largely placed at grammatical link in speech production (Goldman-Eisler 1958). Taken together, the duration of silent pause has strong relationship with syntactic boundary; relativizer as in (10c) in particular has distinctive pause.

3.2 Experimental method for duration of silent pause

Assumption

The primary aim of our work here is to measure the duration of silent pause between the ending point of main predicate and the starting point of extraposed relative pronoun through the comparison between RCE and its canonical construction. This is in line with the intention to verify whether RCE is treated as discontinuous syntactic structure. First and foremost, we assume that the heavier information on extraposed relative clause produces more distinctive duration of silent pause between main predicate and extraposed relativizer, thus proving clear syntactic boundary. On the other hand, with non-RCE construction, it is the other way around; the length of silent pause is assumed not to be significantly changed irrespective of the grammatical weight of relative modifier. Göbbel's (2013) claims that relative clause easily tends to become phrased together with its antecedent that it immediately modifies. Thus, canonical construction would produce less duration of silent pause between head noun and its modifier because there is no intervention in between.

Participants and material

Three native American speakers participate in this experiment; two are male (i.e., M1 and M2) and the other is female (i.e., F1). All participants have no speech production disorder. Their age ranges from late 20s to early 30s. As described earlier, prior context and background are strongly associated with the use of RCE, so context-based RCE was extracted from BYU-BNC and COCA, and then discourse-based counterpart to RCE (i.e., non-RCE) is artificially configured to test the comparison. We also collect spontaneously spoken relative clause data from Buckeye Speech Corpus in order to corroborate that the behavior of its duration of silent pause is identical with that of artificial non-RCE irrespective of grammatical position.[5] The process taken here is presented in great detail

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5   Buckeye Speech Corpus provides approximately 300,000 words of conversational speech by 43 native central Ohio speakers. Interview data are archived on recording files.

as follows:

(11) Context-based examples extracted from BYU-BNC and COCA:

    a. Simple example template is made solely on grounds of three factors, thereby giving rise to a total of 32 examples: discourse-based classification of RCE and artificial non-RCE, extraposed relativizer (i.e., *which, who, that*), and grammatical weight of extraposed relative clause ranging from three to fourteen words.

    b. Only Discourse-Old-Old-RCE is not found that consists of more than fourteen constituents within extraposed relative clause.

    c. Extraposed relative clause needs subject filler.

    d. Target RCE and artificial non-RCE sentences are placed at the end of context.

    e. If the coda of last syllable in the final word of main predicate is liquid (e.g., /r/, /l/) or nasal (e.g., /n/, /m/, /ŋ/), it is replaced with another sound (e.g., plosive) to consider segment effect.

(12) Spontaneously spoken relative clause data collected from Buckeye Speech Corpus:

    a. A total of 137 examples are randomly extracted from 10 speakers: 5 young and 5 old speakers in terms of age, and 3 males and 7 females in terms of gender.

    b. Spontaneously spoken relative clause occurring in different grammatical functions is in comparison with RCE and artificial non-RCE.

Procedure

Given a pilot study, one participant spent one hour on recording a total of 32 sentences three times. This ambitious preparation made him totally exhausted in the process of the recording experiment, so we diminished the test data into a total of 32 sentences one time, taking less than 20 mins to record. Recording proceeded with a hypersensitive recorder.[6] Target RCE and artificial non-RCE sentences were randomly presented to all participants through Kelvin program; the purpose of this experiment was fully explained to each participant.[7] Spontaneous speech was subsequently recorded and

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6   The recorder used here is SONY IC recorder ICD-UX512F/UX513F.

transcribed. The sequences of sound and silence as well as pause duration were also measured. The recording data were analyzed with the help of Praat.[8] Each voice file became segmented and simultaneously individual grammatical boundary was identified through a textgrids-generating script. At the final stage, VoiceSauce program was used to extract the duration of silent pause from segmented boundaries.[9]

3.3 Results and discussion

Comparison between spontaneously spoken relative clause and artificial non-RCE

We check whether spontaneously spoken relative clause collected from Buckeye Speech Corpus shows identical duration of silent pause between antecedent and its relative clause with artificial non-RCE; both relative clause data reside in every grammatical function. They are compared with the help of independent-sample t-test:[10]

(13) a. Her grandparents [**silent pause**] that died in the holocaust went to hell.

(Buckeye 0601b)

b. Some smoke detectors [**silent pause**] that resemble tree decorations are utilized.

Table 1. Comparison between spontaneously spoken relative and artificial non-RCE

Grammatical functions	M1	F1	M2
Subject	$t(15.217)= 2.770$, $p<.05$	$t(15.131)= 2.251$, $p<.05$	$t(48)= 3.098$, $p<.05$
Object	$t(15.771)= 2.520$, $p<.05$	$t(15.465)= 2.063$, $p=.056$	$t(52)= 0.932$, $p=.356$
Predicative complement	$t(16.257)= 2.605$, $p<.05$	$t(15.760)= 2.135$, $p<.05$	$t(27)= 1.483$, $p=.150$
Adjunct	$t(15.721)= 2.284$, $p<.05$	$t(15.435)= 1.878$, $p=.079$	$t(50)= 0.155$, $p=.877$

Unexpectedly, M1's result is quite revealing; it shows a salient difference in the duration of silent pause. On the other hand, F1 provides us with another finding that the length

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7   Kelvin program shows examples to participants randomly. This enables researchers to collect spoken data and to experiment perception test. The program is available at http:// homepages.wmich. edu/ ~hillenbr/.

8   Praat is a phonetic computer analyzer program, and it is available online.

9   VoiceSauce is an application program implemented in Matlab, thereby providing automated voice measurements from audio recordings. This is also available at http://www.seas.ucla.edu/ spapl/voicesauce/.

10 We used IBM SPSS Statistics 21.0.

of silent pause residing in object and adjunct position does not draw a distinction between naturally occurring relative clause and artificial non-RCE. This implies that we should consider the variation of each participant. In the same line, M2's result supports our argument (i.e., individual variation); null hypothesis except subject position are accepted. Considering all these facts, a meaningful statement is drawn that the duration of silent pause of spontaneous speech corpus like (13a) is not totally idiosyncratic and heterogeneous from that of artificial non-RCE like (13b).

Comparison between spontaneously spoken relative clause and RCE

The duration of silent pause occurring in naturally spoken corpus data like (13a) is totally different from that residing in the niche between the ending point of main predicate and the starting point of extraposed relativizer:

(14) Some smoke detectors are utilized [**silent pause**] that resemble tree decorations.   (COCA 1990)

Table 2. Comparison between spontaneously spoken relative and RCE

Grammatical functions	M1	F1	M2
Subject	$t(15.126)= 4.218$, $p<.05$	$t(15.177)= 4.409$, $p<.05$	$t(11.155)= 3.839$, $p<.05$
Object	$t(15.447)= 4.023$, $p<.05$	$t(15.628)= 4.173$, $p<.05$	$t(11.551)= 3.583$, $p<.05$
Predicative complement	$t(15.731)= 4.085$, $p<.05$	$t(16.024)= 4.240$, $p<.05$	$t(11.902)= 3.659$, $p<.05$
Adjunct	$t(15.418)= 3.843$, $p<.05$	$t(15.587)= 3.960$, $p<.05$	$t(11.515)= 3.351$, $p<.05$

Table 2 tells us that all research hypotheses are accepted. Interestingly, silent pause (i.e., 131.764 msec) as in (14) has significantly longer duration than unfilled pause (i.e., 21.768 msec on average) as in (13a). Hence, it appears to be no coincidence that RCE is interpreted as discontinuous structure.

Comparison between RCE and artificial non-RCE

The comparative examination of RCE and artificial non-RCE contributing to the duration of silent pause achieves the desired result with the help of a paired-sample t-test:

(15) a. Some smoke detectors are utilized [**silent pause**] that resemble tree
          decorations.   (COCA 1990)
      b. Some smoke detectors [**silent pause**] that resemble tree decorations are
          utilized.

Table 3. Comparison between RCE and artificial non-RCE

	M1	F1	M2
Duration	$t(15) = 2.212$, $p<.05$	$t(15) = 2.187$, $p<.05$	$t(11) = 3.252$, $p<.05$

Table 3 shows that two structures significantly differ in the duration of silent pause; RCE
(i.e., 119.187 msec) has longer average duration of unfilled pause than artificial non-RCE
(i.e., 72.508 msec). This finding goes in tandem with Duez's (1985) study that longer
duration of silent pause occurring at syntactic boundary tends to be more easily identified.
Once again, the same conclusion is drawn that extraposed relative clause is syntactically
detached, proving that RCE is grammatically discontinuous structure.

The next idiosyncratic point to be addressed here is the presentation of the opposite
of the desired result. Under the earlier assumption, the heavier grammatical weight of
extraposed relative clause could produce more distinctive duration of silent pause between
main predicate and extraposed relative clause. However, the opposite is true for this case:

Table 4. Diff. value of pause duration between RCE and artificial non-RCE[11]

RCE type	Weight of relative clause	M1	F1	M2
Discourse-Old-New-RCE	8 words	-38.191 msec	64.369 msec	240.119 msec
	14 words	-12.587 msec	-23.653 msec	no case
Discourse-New-Old-RCE	9 words	-70.957 msec	-10.325 msec	-5.299 msec
	13 words	-16.256 msec	-14.192 msec	no case
Discourse-New-New-RCE	14 words	-18.363 msec	-44.325 msec	no case

Negative values in Table 4 say in effect that the length of silent pause of artificial
non-RCE is longer than that of RCE. Interestingly, in the case of less than four words
within the weight of relative clause, the value is always positive, but it changes into
negative value when the grammatical weight of relative clause reaches to more than

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11 M2's no case is due to the fact that he was intentionally not involved in recording such types of RCE. The
    number of constituents within relative clause ranges from three to fourteen words.

thirteen words. In other words, the length of unfilled pause of RCE decreases while the duration of silent pause of artificial non-RCE rather increases. This interesting anomaly is particularly evident in Discourse-New-Old-RCE which shows the highest rise in the type of RCE (i.e., 61.31%). For the case of thirteen words of Discourse-New-Old-RCE, the duration of silent pause ranges from 13.15 msec to 47.304 msec whose values are nearly in agreement with those of relative clauses extracted from Buckeye Speech Corpus. On this understanding, we may surmise that heavier extraposed relative clause seems to be integrated with the preceding grammatical function (i.e, the ending point of main predicate). Taken together, the unexpected and idiosyncratic behavior of silent pause leads us to raise several questions: why does the duration of silent pause of RCE decrease when extraposed relative clause becomes heavier?, Is this construed as speakers' lazy tactic toward producing long utterance?, or Does human prefer to ignore syntactic boundary when they process longer information of extrasposed relative clause? Further investigation needs to be carried out to answer the questions.

4. Perspective on focus effect

4.1 Previous studies on prosodic structure

Of considerable interest here is focus effect (i.e. pitch increase) which provide us with a plausible answer about the decreasing behavior of silent pause when extraposed relative clause delivers heavier weight. Individual language introduces pitch modulation over utterances in order to deliver specific pragmatic meanings of sentence-level structures (Jun 2016). Speakers often intend to carry the main points they want to pass on remarkably, or they highlight their cores to some extent. Thus, the difference in intonation comes into existence according to stressed meanings of phrases or sentences (Ladefoged 2001). In the same context, pitch variation represents focus and emotional status, so focused item within sentence becomes more salient with the help of the variation of intonation (Oh and Kim 2004). As well, Göbbel (2013) claims that the prosodic structure of RCE reflects focus, syntactic structure, and grammatical weight. RCE is focus-neutralized sentence (i.e., deaccentuation), whereas its canonical construction holds focus on main predicate. Féry and Kügler (2008) asserts that in German focus is strongly associated with lengthening of duration. The duration of

focused constituent is considerably longer than that of non-focused element.

Autosegmental-metrical (AM) model of intonational phonology in English represents intonation at sentence-level construction by linear sequences of two prominent pitches: low(L), high(H), and their combinations (Beckman and Pierrehumbert 1986). Stressed syllables of predominant words are tonally marked (i.e., pitch accent).[12] Accordingly, when one constituent becomes focused, it carries nuclear pitch accent such as H*, H*+L% or L+H*, simultaneously deaccenting the following pitch accents (Baltazani and Jun 1999; Oh 2008; Jun 2016). Göbbel (2013) also claims that speakers put pitch accent on subject NP of RCE, while the rest becomes deaccentuated.

In English there are two syntactic structures to carry distinctive focus: *it*-cleft and pseudo-cleft (Saeed 1997; Kim 2012):

(16) a. It is **the flowers** that he bought.
    b. What we want to know is **his story**.

Only clefted NP as in (16a) typically moves to focus-related position in order to deliver speaker′s main point remarkably, thus receiving high degree of pitch increase (Reeve 2011). Further, pseudo-cleft construction as in (16b) places an emphasis on predicative complement (i.e., *his story*).

Considering these points, we feel strong necessity to probe into pitch increase (hereafter focus effect) of focused element. In doing so, we do again another experiment for focus effect on several constructions: *it*-cleft, pseudo-cleft, RCE and artificial non-RCE.

4.2 Experimental method for focus effect

Assumption

Following Göbbel (2013), we assume that artificial non-RCE produces remarkable focus effect on main predicate, but its focus effect will be alleviated when relative clause is postposed at the end of a sentence.

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12 When utterances in English are accented, they are characterized by pitch accents as being described with one of types: H*, L*, H*+L, H+L*, L+H*, L*+H (Beckman and Pierrehumbert 1986). The starred tone is metrically strong tone.

Participants and material

We make use of the identical context-based RCE and artificial non-RCE examples introduced to three native American speakers in the earlier experiment for the duration of silent pause. As well, Buckeye Speech Corpus is employed to measure degrees of pitch increase on focused elements, particularly residing in pseudo-cleft as well as *it*-cleft construction. The process taken here is fully illustrated as follows:

(17) *it*-cleft construction collected from Buckeye Speech Corpus:
Of spontaneous speech recording files, a total of 14 examples are extracted from 10 native American speakers.

(18) Pseudo-cleft construction collected from Buckeye Speech Corpus:
A total of 13 examples of bare pseudo-cleft and 9 instances of pseudo-cleft immediately followed by adjunct clause are respectively brought from 20 native American speakers of spontaneous speech recording files.

(19) Context-based RCE and artificial non-RCE contructions extracted from BYU-BNC and COCA:
We analyze narrowly-focused main predicates of 32 sentences of RCE and artificial non-RCE produced under the identical conditions as described in (11). Narrow focus triggers the increase in pitch (Féry and Kügler 2008).

Procedure

The degree of pitch increase introduced here is to measure the rise in ratio between the average pitch of the word immediately preceding focused element and the peak point of pitch contour of the focused element. In other words, pitch rising means the difference in 'pitch-to-average pitch' value, indicating how much pitch increases in focused element from preceding word. The validity of this experiment begins with pitch increase of *it*-cleft construction as reference point. Simultaneously, its pitch rising is compared with that of pseudo-cleft construction. The same is true for artificial non-RCE which is assumed to receive focus pitch on main predicate. We also delve into the comparison of pitch increase between bare pseudo-cleft clause and pseudo-cleft construction whose main predicate is immediately followed by adjunct. Last, we look into the pitch variation on main predicate before-and-after the extraposition of relative clause. All the process taken here is same with the method that we dealt with earlier; we employ hypersensitive recorder, Kelvin, Praat and VoiceSauce programs.

4.3 Results and discussion

As in *it*-cleft construction, focused element receives the pitch increase of 27.49% on average, while bare pseudo-cleft construction shows the pitch rise of mean 107.55% on focused constituent:

(20) a. It's also **the parent** that has to set the example.   (Bukeye 0205a)
b. What they ought to start doing is **taping**.   (Buckeye 0205b)
c. What really hurts them the most is **the people** that actually give them the money on high street because it really doesn't motivate them to get out of the gutter.   (Buckeye 0602a)

Interestingly, when focused element of bare pseudo-cleft structure as in (20b) becomes shorter, it tends to produce higher rise in pitch ratio (i.e., 117.99% on average). On the other hand, when focused phrase (i.e., *the people*) as in (20c) is immediately followed by adjunct clause, its pitch rise dramatically decreases (i.e., 44.15% on average). Interestingly enough, RCE and artificial non-RCE show rather idiosyncratic pitch rise:

(21) a. Only those strategies **will be used** that significantly solve practical problems.   (COCA 2001)
b. Only those strategies that significantly solve practical problems **will be used**.

Table 5. Pitch increase in RCE and artificial non-RCE

Weight of relative clause	RCE	artificial non-RCE
3-4 words	50.40%	49.44%
8-9 words	54.68%	42.15%
13-14 words	59.13%	24.70%

As described in Table 5, as the grammatical weight of relative clause becomes heavier, main predicate of RCE as in (21a) receives slightly increasing pitch degree (e.g., 61.66%), whereas artificial non-RCE as in (21b) shows continuous fall in pitch ratio (e.g., 29.57%). This consistent pitch behavior enables us to assume that extraposition is strongly associated with increasing pitch rise. In other word, the longer information

relative clause holds, the higher the probability for extraposition to be employed becomes with the feature of stronger focus effect in order to deliver speakers' illocutionary acts more remarkably.

   With all of these findings in mind, several principles are made to provide the plausible reason for extraposition as well as the explanation for the decreasing duration of silent pause raised in Section 3.3:[13]

   (22) Condition to produce focus effect:
        Grammatical element can receive focus effect to deliver speaker's illocutionary acts more remarkably. Subject usually becomes non-focused, whereas focused constituent resides in main predicate.
   (23) Hierarchy of focus effect determiners:
        Shorter Non-Focus > Shorter Focus > Longer Focus > Longer Non-Focus

Table 6. Focus effect table

		Main predicate	
		Shorter Focus	Longer Focus
Subject	Shorter Non-Focus	**1st** (e.g., bare pseudo-cleft)	**2nd** (e.g., RCE, pseudo-cleft followed by adjunct, *it*-cleft)
	Longer Non-Focus	**3rd** (e.g., non-RCE)	**4th** (no case)

The principles in (22-23) and Table 6 say in effect that several focus effect determiners and their combinations should be harmonious to maximize focus effect to deliver speaker's illocutionary acts more remarkably. Our rudimentary assumption starts with one simple condition like (22), implying that every grammatical element can receive focus effect. Non-focused information usually comes in subject position, whereas focused constituent is placed in main predicate. Concerning (23), there is a hierarchy among focus effect determiners to result in different degrees of focus effect according to their grammatical weight and status. Under one identical condition that one focused main predicate is short, Shorter Non-Focus (i.e., non-focused subject) holding shorter information produces stronger focus effect than subject which has longer constituent. As well, 'Shorter Non-Focus > Shorter Focus > Longer Focus' has the implication that focus

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13 These findings are in line with Lee (2017).

effect of shorter non-focused subject with shorter focused main predicate (i.e., Shorter Focus) surpasses that of shorter non-focused external argument with longer focused main predicate (i.e., Longer Focus). Last, 'Longer Focus > Longer Non-Focus' indicates that shorter non-focused subject with longer focused main predicate produces stronger focus effect than longer non-focused subject (i.e., Longer Non-Focus) with shorter focused main predicate. Suffice to say, Shorter Non-Focus on the left side of grid in (23) is the most powerful determinant to maximize focus effect, whereas Longer Non-Focus on the right side of the grid is the factor to produce the weakest focus effect. For all these reasons, we postulate that the shorter subject a sentence has, the stronger focus effect it produces. When it has longer subject, it generates the weakest focus effect. Thus, Table 6 describes that determiners are well combined to explicate different degrees of focus effect. One thing to notice here is that RCE (i.e., 2nd case) produces stronger focus effect than its canonical construction (3rd case). As a consequence, this fact provides us with a plausible answer for extraposition of relative clause.

    (24) Focus maximum principle:
        The combination of short non-focused subject and short focused main predicate followed by no constituent produces the strongest focus effect.
    (25) Focus cohesion principle:
        Focused element followed by its adjacent constituent tends to merge as many as possible within its specific phrase boundary, thereby resulting in collapse of grammatical function, reduction of pause duration and difficulty in understanding utterance.

More to the point, the strongest focus effect (e.g., pseudo-cleft) is generated when short non-focused subject joins with short focused main predicate, termed as focus maximum principle in (24). However, when complicated and long focused main predicate is preceded by long and complex non-focused subject, the weakest focus effect will come into existence.[14] Last of all, we propose that the decreasing duration of silent pause of RCE is due to focus cohesion principle in (25). A focused element followed by adjunct constituent tends to merge and haul as many adjacent elements as possible within its specific phrase boundary, thereby driving speakers to ignore grammatical cohesive device

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14 The 4th case is not examined in this paper, but we can fully make prediction that it would produce the weakest focus effect according to hierarchy of focus effect determiners.

(i.e., extraposed relative pronoun), decrease the duration of silent pause, and even encounter difficulties in understanding utterance. This assumption goes in tandem with Baltazani and Jun's (1999) study that focus gets rid of boundaries of words followed by focused elements, and simultaneously deprives all following words of accents. As well, focus shortens the duration of before-and-after positions of focused words. Oh (2001) also supports that focused words have the strong influence of prosodic phrasing, F0, and duration of their preceding and following constituents, so they easily tend to be dephrased and neutralized. The propositions assumed here are elaborated in great detail below.

Shorter Non-Focus

A comparison of bare pseudo-cleft construction with artificial non-RCE shows that Shorter Non-Focus in (23) is the most powerful focus effect determiner. The average number of constituents within focused main predicates of both constructions ranges from two to three words. However, subject of bare pseudo-cleft construction has four words on average, whereas the average number of constituents within subject of non-RCE is ten words. Without a doubt, bare pseudo-cleft construction (107.55% on average) which consists of short non-focused subject and short focused main predicate has predominantly stronger focus effect than non-RCE structure (46.41% on average) which has longer non-focused external argument with short focused main predicate: $t(55)= -4.233$, $p<.05$.

Shorter Non-Focus > Shorter Focus > Longer Focus

This order implies that focus effect of shorter non-focused subject with shorter focused main predicate surpasses that of shorter non-focused subject with longer focused main predicate. Here too pseudo-cleft structure followed by adjunct clause (44.15% on average) has weaker focus effect than bare pseudo-cleft construction (107.55% on average): $t(14.469) = -4.570$, $p<.05$. Not unexpectedly, subjects of both pseudo-cleft constructions have four words on average, but the average number of focused main predicates followed by no constituents is four words while that of the other construction is fourteen words on average. This finding tells us that heavier main predicate can be one factor to produce weaker focus effect.

Another comparison of bare pseudo-cleft construction with RCE also lends weight to the argument. The average number of constituents within subject of RCE is three words while its focused main predicate holds nine words on average. As in bare pseudo-cleft construction, four words averagely comes in subject and focused main predicate

respectively. Undoubtedly, due to the grammatical heaviness within focused main predicate, focus effect differentiates between bare pseudo-cleft (107.55% on average) and RCE (52.55% on average): $t(55)=$ -4.503, $p<.05$.

There is further evidence that the strength of focus effect lies in the length of focused main predicate with the help of a comparison between *it*-cleft and RCE. Semantically dummy subject of *it*-cleft construction has only one word, but its focused phrase is followed by incomplete clause consisting of eleven words on average. Subject of RCE averagely has three words and its focused main predicate holds nine words on average. Along the same line, RCE (52.55% on average) has higher degree of pitch increase than *it*-cleft construction (27.49% on average): $t(56)=$ -2.490, $p<.05$.

Longer Focus > Longer Non-Focus

The hierarchy in (23) says in effect that as default value, shorter non-focused subject on the extreme left is favored as the most for stronger focus effect, whereas longer non-focused subject on the extreme right is highly likely to produce the weakest focus effect. In this sense, we presuppose that longer focused main predicate has a strong association with shorter non-focused subject, while longer non-focused subject has much to do with shorter focused main predicate. Accordingly, the former has stronger focus effect than the latter. A comparison of RCE with artificial non-RCE provides support for this stance. Interestingly, only M1's data rejects null hypothesis, but it shows that RCE (36.86% on average) has stronger focus effect than non-RCE (20.70% on average): $t(7)=$ 2.655, $p<.05$. Not only does this fact raise the necessity to probe further into individual variation in pitch increase, but a conclusive statement is drawn that extraposition of relative clause is employed to produce stronger focus effect to deliver speaker's main point more remarkably as well.

4.4 Questionnaire survey

Assumption

We open this section with support of focus cohesion principle in (25) by conducting a questionnaire survey of speakers' reading time in understanding of RCE as well as artificial non-RCE. This attempt documents an important reason into why the duration of silent pause of RCE decreases as the weight of extraposed modifier becomes heavier.

Participants

Two types of questionnaire are devised to attain meaningful insight from four participants. NA1 (native American male) is early 30s, who has stayed in Seoul for 2 years. KF1 (intermediate Korean female learner of English) is an English teacher at English academy, and KF2 (beginner Korean female learner of English) is a sophomore at university, who has never tried any official English test. KM1 (advanced Korean male learner of English) is an English teacher at high school.

Material: questionnaire type A

Questionnaire type A is specifically configured to delve into a comparative examination of reading time in the interpretation of RCE and artificial non-RCE. Twelve examples of RCE and artificial non-RCE are respectively devised from BYU-BNC and COCA (i.e., a total of 24 examples), and the respective target sentence is placed at the end of context-based passage. Not only does all test data reflect the discourse-based classification of RCE, but the number of constituents within relative clause ranges from three to sixteen words as well. More to the point, five questions are given to every test example in order to check whether each participant fully understands RCE or artificial non-RCE. Of course, if they can not provide proper answers, they are allowed to leave them empty.

Table 7. Example of questionnaire type A

Context	Questions
Why are safety standards in the UK inadequate? Because it is the manufacturers who make the standards, with little or no input from the users or consumers. This means that only the 20,000 readers of British Standards Institution publications hear about them. It was only my individual objection which stopped an unsatisfactory standard for smoke masks being introduced 10 years ago. **Now a sprinkler system has been developed which could be fitted to an aircraft and would put fires out within 10 seconds.**	1) What is subject NP of the target sentence? 2) What is main predicate of the target sentence? 3) Is there any focused information in the target sentence, you think? 4) Is the information on relative clause already mentioned in the context? If so, please underline the information in the preceding context 5) Is subject NP of the target sentence already introduced in the context? If so, please underline the information in the preceding context.

Material: questionnaire type B

Each participant needs to fill out a blank with one out of two plausible answers: RCE

or artificial non-RCE sentence. Every blank is given at the end of a total of 16 context-based examples. In what follows, they are required to provide further reasons for two given questions. Not only is it possible to leave no response, but they can choose both answers as well. Here too all test data are arranged according to the discourse-based classification of RCE and the number of constituents within relative clause ranges from three to eighteen words.

Table 8. Example of questionnaire type B

Context		Answer	Questions
To be an natural curricular model, it must provide MVPA for at least 50% of the physical education class. A common feature of the sport education model is smaller team size. To date the sport education model has not addressed the role of smaller team size in providing the natural intensity during the games. Furthermore, many physical education programs play the adult version of games or have teams with five players or more per side. To date, [_____].	A	no findings that have revealed the natural team size necessary to meet the objective of providing MVPA for 50% of physical education class time **have been published**.	1) Which one would you like to choose as a more natural sentence? Why? 2) Why didn't you choose the other?
	B	no findings **have been published** that have revealed the natural team size necessary to meet the objective of providing MVPA for 50% of physical education class time.	

Procedure

One native American male already checked the suitability of test data provided here, and each participant was also interviewed with full explanation for the purpose of this survey in advance. For reference, the test was too difficult for KF2 to complete this survey, but others spent almost one and half an hour on completing all tasks. For questionnaire type A, we measured how much time each participant spent on solving questions for RCE as well artificial non-RCE in order to figure out which construction is faster and easier to process. For questionnaire type B, two given answers are randomly placed to fill out a blank of each question.

Results and discussion

As in questionnaire type A, we interpret the results of only NE1 and KM1 because the recording device for reading time of KF1 malfunctioned, so her data was not brought

here. Interestingly, when relative clause holds three to four words, participants somewhat show faster reading time (i.e., positive value in Diff.) in non-RCE than RCE as follows:

Table 9. Reading time ratio in RCE and non-RCE

	NA1	KM1
Weight of Relative	Diff.(RCE-non RCE)	Diff.(RCE-non RCE)
3 words	**0.05%**	**0.95%**
3 words	**0.13%**	-0.65%
3 words	-0.36%	**0.20%**
4 words	**0.55%**	**0.51%**
8 words	0.54%	0.78%
9 words	**-0.12%**	3.47%
9 words	0.46%	**-0.51%**
9 words	**-0.11%**	0.82%
11 words	**-0.19%**	**-1.24%**
12 words	**-0.18%**	**-1.54%**
14 words	**-0.61%**	**-0.71%**
16 words	**-0.16%**	**-2.07%**

However, when the grammatical weight of relative clause amounts to more than eleven words, two participants identically show consistent pattern. In other words, RCE is easier and faster to understand than non-RCE when the information on relative clause is quite long; negative value in Diff. in Table 9 implies that participant spends more time on the interpretation of non-RCE.

As far as questionnaire type B is concerned, one common behavior of Korean participants is that they prefer to choose non-RCE when relative clause is quite short. However, when the information on relative clause becomes heavier (i.e., more than thirteen words), extraposition is favored over canonical construction. Interestingly, KM1 interprets RCE as a complex construction consisting of two individual sentences. That is, one is made solely grounds of subject NP and main predicate, whereas the other is extraposed relative clause. This finding enables us to plot one interesting scenario that KM1 starts to unconsciously ignore syntactic boundary between main predicate and extraposed relative clause, collapse grammatical cohesive device (i.e., extraposed relative pronoun), and even construe extraposed relative clause as non-restrictive relative, thereby adopting sequential interpretation. This is in accordance with focus cohesion principle in (25).

(26) a. The back of the case is raised slightly **which** tilts the tablet to form a convenient drawing surface.   (BYU-BNC 1985-1994)

   b. The back of the case is raised slightly [Ø] tilts the tablet to form a convenient drawing surface.

As introduced earlier, the tilting event as in (26a) precedes the raising event with the help of cohesive device (i.e., extraposed relativizer). However, in (26b) the tilting event follows the raising event (i.e., sequential interpretation) due to null pronoun. Taken together, KM1 ignores cohesive device in (26a) and simultaneously interprets RCE as sequential construction.

Here too the same is true for NE1. He feels that the separation of restrictive relative clause from its head noun is quite unnatural, so he resists the use of RCE although relative clause becomes quite heavier; he shows high use (i.e., 81.25%) in non-RCE. He bases his view on the reason that non-RCE is interpreted as sequential order of event structure, but unexpectedly RCE also lies in sequential interpretation. Thus, he feels the difficulty in figuring out RCE properly. This finding tells us that one of reasons why NE1 and KM1 show faster reading time in RCE when relative clause loads more than 11 words is due to focus cohesion principle. RCE seems to be superficially easier and faster to read, but participants become deceived, being inclined to misinterpret RCE sequentially. Once again, focused main predicate of RCE hauls and merges its following constituents as many as possible, thus leading to collapse of grammatical cohesive device (i.e., extraposed relativizer), decrease of silent pause, and even misunderstanding of utterance. Not surprisingly, when extraposed relative clause loads heavier information, the intensity of cohesion will become stronger.[15]

5. Conclusion

English relative clause extraposition shows discontinuous syntactic structure, violating a typical X-bar rule. This study proposes that extraposition is employed to produce stronger focus effect (i.e., pitch increase) on main predicate, thus emphasizing speaker's illocutionary acts more remarkably, through a series of two experimental investigations and one

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15 Dephrasing phenomenon disappears when no constituents are preceded by focused constituents (Oh and Kim 2004).

questionnaire survey. In doing so, we briefly introduce the grammatical properties as well as the discourse-based classification of RCE with the help of BYU-BNC, COCA, and Buckeye Speech Corpus. Not only is the grammatical weight of relative clause likely to be one plausible trigger for extraposition, but RCE is also classified into four types under the assumption of extraposed relativizer as cohesive device.

On closer examination, this study highlights the duration of silent pause between the ending of main predicate and the beginning of extraposed relative pronoun in order to prove discontinuous structure of RCE, but one experimental study yields an unexpected result that the length of silent pause of RCE decreases when the information on extraposed relative clause becomes heavier. This idiosyncratic behavior is found in the preponderance of Discourse-New-Old-RCE which shows the highest frequency overall (i.e., 61.31%). The decreasing phenomenon of silent pause further leads us to illuminate focus effect to get a plausible answer through the other experimental investigation. In other words, extraposition is triggered by speaker′s desire to produce stronger focus effect on main predicate. Along the same line, we assume a hierarchy of focus effect determiners, focus effect table, focus maximum principle, and focus cohesion principle with the aid of investigation on several constructions: *it*-cleft, pseudo-cleft, RCE, and non-RCE. Focus effect determiners are hierarchically ordered and subsequently they are combined according to degrees of pitch increase in Focus Effect Table. Hence, RCE is classified into the 2nd case, whereas its canonical construction holds for the 3rd case. Interestingly enough, extraposition of relative clause is employed to generate stronger focus effect to place an emphasis on main predicate. As well, pseudo-cleft construction consisting of shorter non-focused subject and shorter focused main predicate has the most powerful and salient focus effect, thus satisfying focus maximum principle. Last, focus cohesion principle provides us with a principled explanation for focus effect as well as the decreasing pause duration, with the help of one questionnaire survey. Focused element hauls neighboring constituents within its boundary, thereby leading to collapse of grammatical device, decrease of pause duration, and even misunderstanding of utterances. The survey documents the principle where one English native and one advanced Korean learner of English disregard extraposed relativizer (i.e., cohesive device), and interpret RCE as sequential construction when the information on extraposed relative clause loads more than 11 words. Overall then, a conclusive statement is drawn that focus effect is one fundamental reason for idiosyncratic decrease of silent pause as well as extraposition of relative clause.

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