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English (Zero-)Relatives and the Competence-Performance Distinction*

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Abstract
This article considers English zero-relatives ((*this is*) *a book* ∅ *you should read*). Zero-relatives are unacceptable, and arguably "ungrammatical", when what is initial in the zero-relative is something other than a subject noun phrase. An analysis of the evidence suggests that the unacceptable cases do not reflect the grammar or grammatical principles, but processing complexity. This observation leads in turn to the proposal that what is considered to fall under linguistic competence (grammar) is much more restricted than is typically assumed, and that many supposedly grammatical phenomena are to be explained in other terms.

Keywords
English syntax; syntactic theory; grammatical constraints; processing complexity

1. Introduction

In this paper I discuss a number of problems with English zero-relatives that have been observed over the years. They lend further support to the view that many syntactic phenomena that until now have been thought of as "ungrammatical" actually reflect complexity of processing. That is, the cases in question are syntactically well-formed in a strict sense (they are "grammatical"), but are unacceptable due to difficulties in processing the mapping between syntactic configuration and meaning. While the cases I consider here are relatively mundane, compared to well-known "core"

* I don't think that Mike Harnish worked on the specific linguistic phenomena discussed in this paper, but he was certainly deeply interested in sentence processing and foundational issues such as the competence/performance distinction. I regret more than I can say that he and I no longer have the opportunity to talk about these and many other things. He was a great friend and a terrific scholar.

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constructions such as *wh*-questions, passive and raising, the implications for syntactic theory are potentially far-reaching.

The zero-relative is characterized by the fact that there is no marker to show that it is a relative clause. Consider the examples in (1). The relative clause with *which* is a *wh*-relative, the one with *that* is a *that*-relative, and the one with nothing in initial position before the subject (marked here as ∅) is a zero-relative.

(1) a book { which / that / ∅ } you should read

Jaeger and Tily (2011) found the more predictable *that* is in a given context, the more likely it is that it will be omitted. As I show below, there are several constructions in English involving relative clauses that are less acceptable or completely unacceptable as zero-relatives than as marked relatives, which I refer to here as "marked" relatives. I argue that the overall pattern of judgments is best explained in terms of the processing of zero-relatives, as opposed to an account that rules out the less than fully acceptable examples on the basis of their syntactic configuration. The basic idea is that the processor does not expect a relative clause and because there is no marker, the relative clause is difficult or impossible to identify when it is first encountered. In some cases the absence of a marker results in a garden path. However, even in the absence of a garden path option, these zero-relatives still make it very difficult to posit what the coming structure is going to be.

The structure of the paper is the following. In § 2 I review data that shows that it is unacceptable in English to adjoin a constituent at the left periphery of a zero-relative clause, while similar adjunction to a marked relative is acceptable. A typical example is given in (2).

(2) a book { which / that / *∅ } if you have time you should read

I develop as a straw man a grammatical account of this and similar unacceptability judgments and sketch out a contrasting performance account of the data.

In § 3–§ 5 I consider several additional configurations in which such identification is arguably difficult. § 3 looks at cases of stacking, where several relative clauses modify the same head. The evidence shows that a zero-relative is less acceptable the further it is from the head. § 4 reviews evidence that an extraposed zero-relative is less acceptable than its marked rel-

ative counterparts. § 5 shows that zero-relative clauses that are not immediately recognizable as such because their subjects are sentential are significantly less acceptable than their marked relative counterparts.

The weight of the evidence thus suggests that a factor that affects the acceptability of zero-relatives is the presence of a signal that what is being processed is in fact a relative clause. In § 6 I speculate about what this kind of evidence suggests about how we should reason about competence, and more broadly, about the status and scope of the competence-performance distinction.

2. Adjunction in Relative Clauses

In this section I show that it is possible to position a non-subject constituent at the left periphery of a relative clause. I will call this phenomenon "left-adjunction", without presuming that there is a uniform syntactic configuration for all cases. In fact, I suggest below that there is not, which is part of the argument against a grammatical account of the phenomena to be dealt with here. Left-adjunction is more or less acceptable in marked relatives, but marginal at best in zero-relatives. It is possible to rule out the marginal cases by formulating a grammatical constraint against such adjunction; the constraint can be formulated in a number of ways depending on technical details of the syntactic theory. I contrast the grammatical account with a processing account.

Left-adjunction in English is seen in a number of constructions. The most frequently discussed construction is topicalization, illustrated in (3). In (3a) an argument of the verb is adjoined and in (3b) a PP argument is adjoined. The canonical position of the adjoined constituent is denoted by a coindexed trace.

(3) a. $[_{DP}$ A man like that$]_i$, Susan could never marry t_i.
b. $[_{PP}$ On the table$]_i$, Terry carefully deposited a six-pack of beer t_j.

Left-adjunction of an adverb to initial position is also possible. In this case it is somewhat debatable whether there is a canonical position internal to the sentence. The sentences in (4) illustrate.

(4) { Next year / Unfortunately / Because of this / When the time comes } the clocks will have to be reset.

Another construction is negative inversion (5), where the adjoined constituent triggers subject-aux inversion (SAI). Negative inversion is most natural when the adjoined constituent is a PP or an adverb.

(5) { Under no circumstances / Not even for you / Only then / For very few people } would I agree to such a thing.

The occurrence of SAI in this construction but not in (4) is prima facie evidence against a uniform syntactic treatment of the two constructions; I return to this point below.

Another left-adjunction construction is stylistic inversion, where a non-subject is in initial position and the subject is post-verbal. The sentences in (6) illustrate.

(6) a. Into the room marched the remaining hikers.
b. Sitting immediately to the left of Sandy was the largest gorilla that we had ever seen outside of a zoo.

A case can be made for locating the adjoined constituent in the subject position, that is, Spec, IP (Culicover and Levine, 2001). In this respect the structure of the left periphery of stylistic inversion is different from that in topicalization and negative inversion.

Now let us consider data that shows that it is possible to have a left-adjoined constituent in a relative clause. The examples all share the property that there is a non-subject after the relative marker and before the subject of the relative clause. The examples in (7)–(10) are *wh*-relatives.

(7) a. He is a man to whom$_i$ liberty$_j$, we could never grant t_j t_i. (Baltin, 1981)
b. This is the beer$_i$ which on the table$_j$, Sandy deposited carefully t_i t_j.

(8) He is a man to whom { next year / unfortunately / because of this / when the time comes } I will be unable to give any money.

(9) He is a man to whom { under no circumstances / not even for you / only then / for very few people } would I give any money.

(10) a. They then told me about the time when right into the room walked the Queen of England.

b. Please give me one reason why under this very table is sitting the fabulous Hope Diamond.

c. Detroit is a town $\left\{ \begin{array}{c} \text{where} \\ \text{in which} \end{array} \right\}$ in almost every garage can be found a car manufactured by GM.

Corresponding examples with *that*-relatives are shown in (11)–(14).

(11) a. ?He is a man that$_i$ liberty$_j$, we could never grant t_j to t_i.
b. ?This is the beer$_i$ that$_i$ the table$_j$, Sandy deposited carefully t_i on t_j.

(12) He is a man that$_i$ $\left\{ \begin{array}{c} \text{next year} \\ \text{unfortunately} \\ \text{because of this} \\ \text{when the time comes} \end{array} \right\}$ I will be unable to give any money to t_i.

(13) He is a man that$_i$ $\left\{ \begin{array}{c} \text{under no circumstances} \\ \text{not even for you} \\ \text{only then} \\ \text{for very few people} \end{array} \right\}$ would I give any money to t_i.

(14) a. They then told me about the time that into the room walked the Queen of England.
b. Please give me one reason that under this very table is sitting the fabulous Hope Diamond.
c. Detroit is a town that in almost every garage can be found a car manufactured by GM.

The examples in (11) are somewhat less acceptable than the corresponding *wh*-relatives in (7), because there are two traces of argument DPs, the relativized argument and the left-adjoined argument. This particular unacceptability is plausibly due to the processing of the nested dependency, as suggested by Pickering and Barry (1991).

The next group of examples shows the zero-relatives corresponding to (7)–(14).

(15) a. ??He is a man liberty$_j$, we could never grant t_j to t_i.
b. *This is the beer$_i$ the table$_j$, Sandy deposited carefully t_i on t_j.

(16) ??He is a man $\left\{ \begin{array}{c} \text{next year} \\ \text{unfortunately} \\ \text{because of this} \\ \text{when the time comes} \end{array} \right\}$ I will be unable to give any money to t_i.

(17) ??He is a man { under no circumstances / not even for you / only then / for very few people } would I give any money to t_i.

(18) a. *They then told me about the time right into the room walked the Queen of England.
b. *Please give me one reason under this very table is sitting the fabulous Hope Diamond.
c. *Detroit is a town in almost every garage can be found a car manufactured by GM.

The annotated judgments show that the zero-relatives are less acceptable than the corresponding marked relatives.[1]

Consider now how we might rule out the examples in (15)–(18) as ungrammatical. Since the relative clauses themselves are well-formed sentences, the grammatical constraint would have to rule out these configurations *qua* zero-relatives, either directly or indirectly. A direct constraint would have the following form, where by "adjunction to the left boundary of a clause" is meant positioning of a constituent before the subject.

> **Left boundary principle (LBP)**: adjunction to the left boundary of a relative clause is possible only when the left boundary of the phrase is explicitly marked as such (e.g. with a complementizer).

Statements such as the LBP are typical of early work on grammatical constraints such as Ross (1967), where the problematic syntactic configuration is incorporated into the statement of the constraint. For example, the sentential subject constraint says that it is not possible to extract something from a sentential subject. Subsequent constraints in the *Conditions* and *Barriers* frameworks (Chomsky, 1973; Chomsky, 1986) sought to abstract away from the particular configurations to properties of the configurations, such as subjacency, which counts the number of bounding nodes, and government, which takes into account relations such as θ-marking and coindexing.

While one might explore such approaches in the case of the LBP, closer attention to the configurations exemplified above suggests that there is no structural property that covers all of them. The configuration of topicalization in (15)–(16) is either adjunction to IP, as in (19a), or movement to the specifier of a functional topic head, as in (19b).

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[1] These judgments have been confirmed in a non-systematic survey of native speakers. A larger-scale experimental study is currently being planned.

(19) a. the man$_i$ [$_{CP}$ [$_{C}$0 ∅] [$_{IP}$ [$_{DP}$ liberty]$_i$ [$_{IP}$ we would never grant t_i to t_j]]]
b. the man$_i$ [$_{CP}$ [$_{C}$0 ∅] [$_{TP}$ [$_{SPEC}$ [$_{DP}$ liberty]$_i$] T^0 [$_{IP}$ we would never grant t_i to t_j]]]]

The configuration of negative inversion, on the other hand, is most likely the same as that of a *wh*-question, because they both show SAI. Hence the left-adjoined constituent would be in Spec, CP, as shown in (20).

(20) the man$_i$ [$_{CP}$ [$_{SPEC}$ [$_{PP}$ under no circumstances] [$_{C}$0 would] [$_{IP}$ I give any money to t_i]]]

And in stylistic inversion, the left-adjoined constituent is a syntactic subject (Culicover and Levine, 2001).

(21) the time [$_{CP}$ [$_{C}$0 ∅] [$_{IP}$ [$_{PP}$ into the room] walked the Queen of England]]

A comparison of the left periphery of these three constructions does not show any common property, beyond the correct generalization that they lack an overt complementizer and have a constituent that precedes the subject, as stated by the LBP. It is not possible to absolutely rule out the possibility that a configurational generalization can be formulated that covers just these cases. However, as we will see in the following sections, simply the lack of an overt complementizer is sufficient to produce unacceptability in other cases, even when there is no left adjunction. This fact makes the search for a configurational generalization less than promising.

In contrast, the acceptable marked relatives have overt markers that signal the onset of the relative clause. Why should this difference correspond to a difference in acceptability? Intuitively, the left edge of a constituent allows the processor to project the most likely configuration or configurations that include it. For example, if the sequence is *the man that*, the complementizer *that* triggers a rule in the processor that projects the structure [$_{DP}$ *the man* [$_{S\text{-}REL}$ *that* ...]]. If the sequence is *the statement that*, there are (at least) two rules triggered: [$_{DP}$ *the fact* [$_{S\text{-}REL}$ *that* ...]], as in *the fact that I disputed* and [$_{DP}$ *the fact* [$_{S\text{-}COMPL}$ *that* ...]], as in *the fact that I disputed the result*. Assuming parallel processing, each triggered rule is assigned a probability that reflects the frequency of the corresponding configuration in the corpus (Nguyen et al., 2012).

An additional assumption is that the processing complexity of a sequence and, in extreme cases, its acceptability, is determined in part by the correspondence between the projected structure in the course of processing, and the actual structure settled on in the end (Hale, 2001, 2003; Levy, 2005,

2008). In the case of *the fact that*, for example, the probability of the sentential complement analysis is greater than that of the relative clause analysis. In the relative clause case there is a significant slowdown in reading times, signifying greater processing complexity at the gap (Chen et al., 2005).

When there is no explicit marker at the left edge of the relative clause, the processor must depend on other familiar evidence to project the structure, i.e., an initial subject DP. Topicalization in relative clauses even with overt markers appears to be very rare. Since zero-relatives are frequent in English, a sequence such as *a man we* (*could never grant liberty to*) can be reliably assigned the structure [$_{\text{DP}}$ a man [$_{\text{S-REL}}$ we …]], where *we* is clearly the subject of the relative clause. In example (15) the initial sequence is *a man liberty*, which can be reliably assigned the structure [$_{\text{DP}}$ [$_{\text{S-REL}}$ liberty …], where *liberty* is the subject of the relative clause. But in the sequence *a man liberty we*, the subject of the relative clause is actually *we*. There is no basis for treating *liberty* as a topicalized DP with a following subject DP, presumably because the sequence DP-DP-DP does not occur in the corpus. The absence of a rule for processing this sequence leads the processor to engage in some type of repair strategy, with a corresponding reduction in acceptability.

In the remainder of this paper I develop the argument that it is processing complexity that is responsible for the judgments summarized by the LBP.

3. Stacking of Relative Clauses

It is possible in English to stack relative clauses that modify the same head. A simple example of stacking is given in (22).

(22) an actor [$\left\{\begin{matrix}\text{who}\\\text{that}\end{matrix}\right\}$ I interviewed t_i] [$\left\{\begin{matrix}\text{who}\\\text{that}\end{matrix}\right\}$ I didn't like t_i very much]

In this case, *actor* is the direct object that is relativized in the two clauses. Example (23) shows that it is possible to stack more than two relative clauses.

(23) an actor [$\left\{\begin{matrix}\text{who}\\\text{that}\end{matrix}\right\}$ I interviewed t_i] [$\left\{\begin{matrix}\text{who}\\\text{that}\end{matrix}\right\}$ I didn't like t_i very much]
[$\left\{\begin{matrix}\text{who}\\\text{that}\end{matrix}\right\}$ we just saw t_i in a movie last week]

These examples show that the stacked relative can be introduced by either *wh-* or *that*. The examples in (24) show that when one of the relatives is a zero-relative, it is most acceptable when it is adjacent to the head noun. While the judgments are not very sharp, they appear to be increasingly less acceptable as the zero-relative is moved further from the head.

(24) a. (I'll tell you about) the actor [I interviewed t_i] [$\left\{\begin{array}{c}\text{who}\\\text{that}\end{array}\right\}$ I didn't like t_i very much] [$\left\{\begin{array}{c}\text{who}\\\text{that}\end{array}\right\}$ we just saw t_i in a movie last week]

b. ?(I'll tell you about) the actor [$\left\{\begin{array}{c}\text{who}\\\text{that}\end{array}\right\}$ I interviewed t_i] [∅ I didn't like t_i very much] [$\left\{\begin{array}{c}\text{who}\\\text{that}\end{array}\right\}$ we just saw t_i in a movie last week]

c. ??(I'll tell you about) the actor [$\left\{\begin{array}{c}\text{who}\\\text{that}\end{array}\right\}$ I interviewed t_i] [$\left\{\begin{array}{c}\text{who}\\\text{that}\end{array}\right\}$ I didn't like t_i very much] [∅ we just saw t_i in a movie last week]

The following examples show that putting other types of constituents between the head and the zero-relative renders also produces unacceptability. Notice that unacceptability is greater as the intervening constituent is syntactically more complex, as measured by the number of constituents and branching nodes. The sentences in (25) interpose a sentential complement between the head and the zero-relative, those in (26) interpose reduced participial relatives, and those in (27) interpose infinitival relatives.[2]

(25) a. the decision [$\left\{\begin{array}{c}\text{that}\\\varnothing\end{array}\right\}$ you admit you regretted]

b. the decision [to attack] [$\left\{\begin{array}{c}\text{that}\\\varnothing\end{array}\right\}$you admit you regretted]

c. the decision [to attack while screaming] [$\left\{\begin{array}{c}\text{that}\\(?)\varnothing\end{array}\right\}$ you admit you regretted]

d. the decision [to attack the campground] [$\left\{\begin{array}{c}\text{that}\\?\varnothing\end{array}\right\}$ you admit you regretted]

e. the decision [to attack the campground without any warning] [$\left\{\begin{array}{c}\text{that}\\?\varnothing\end{array}\right\}$ you admit you regretted]

f. the decision [that you were going to attack the campground without any warning] [$\left\{\begin{array}{c}\text{that}\\?\varnothing\end{array}\right\}$ you admit you regretted]

g. the decision [revealed last night][that you were going to attack the campground without any warning] [$\left\{\begin{array}{c}\text{that}\\??\varnothing\end{array}\right\}$ you admit you regretted]

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[2] Since the zero-relatives are not projected by the intended heads, the parser attempts to attach them to the immediately adjacent nouns, e.g. *campground, warning, Times, Oscar*. The resulting interpretations are somewhat anomalous, which potentially offers an alternative basis for the reduced acceptability in some, but not all cases. Furthermore, the *that*-relatives presumably are also susceptible to this interpretation, but are more acceptable in the same locations.

(26) a. (I'll tell you about) the actor [interviewed in the Times] [$\left\{\begin{array}{c}\text{that}\\ ?\varnothing\end{array}\right\}$ we just saw *t* in a movie last week]

b. (I'll tell you about) the actor [interviewed in the Times] [recently awarded an Oscar] [$\left\{\begin{array}{c}\text{that}\\ ?\varnothing\end{array}\right\}$ we just saw *t* in a movie last week]

(27) a. (Remind me to ask you the name of) the actor [to interview] [$\left\{\begin{array}{c}\text{that}\\ ?\varnothing\end{array}\right\}$ we just saw *t* in a movie last week]

b. (Remind me to ask you the name of)) the actor [to interview when I'm in LA] [$\left\{\begin{array}{c}\text{that}\\ ?\varnothing\end{array}\right\}$ we just saw *t* in a movie last week]

Again, intuitively, when the *that*-relative is encountered it triggers a search by the parser for the head of the preceding DP, but when the zero-relative is encountered, the parser does not immediately recognize it as a relative clause and has difficulty interpreting it.[3]

Summarizing to this point, the evidence from stacked relative clauses is consistent with the hypothesis that the absence of an overt relative marker makes a zero-relative somewhat more difficult to process, unless it is in a familiar location adjacent to a head noun. We would thus predict that extraposition of zero-relatives would produce similar processing difficulty, since by definition extraposition locates a constituent distant from its head. The next section argues that extraposed zero-relative clauses may be reduced in acceptability compared to the marked relatives, but other factors may render the reduced relative quite predictable and correspondingly acceptable.

4. Extraposition of Relative Clauses

The behaviour of extraposed relative clauses provides an interesting contrast to the cases that we have examined to this point. Many extraposed zero-relatives are subjectively no worse than the corresponding marked relatives, which appears at first sight to be counterevidence to the claim that distancing a zero-relative from the head of the DP introduces unacceptability. Some examples are given in (28).

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[3] On the account of Hawkins (2003: 192 f.), identification of the zero-relative introduces a dependency, which contributes to processing complexity beyond what is required for the marked relative.

(28) a. Some people came in $\left\{\begin{array}{c}\text{who}\\ \text{that}\\ \varnothing\end{array}\right\}$ I didn't recognize.

b. I saw that movie last night $\left\{\begin{array}{c}\text{who}\\ \text{that}\\ \varnothing\end{array}\right\}$ you recommended.

While some extraposed zero-relatives are indeed quite acceptable, it is straightforward to construct cases where they are less acceptable than the corresponding marked relatives; furthermore, there appear to be no cases where the zero-relative is **more** acceptable than the corresponding marked relatives.

(29) a. Some people came in from the other room singing loudly $\left\{\begin{array}{c}\text{who}\\ \text{that}\\ ??\varnothing\end{array}\right\}$ I didn't recognize.

b. I saw a movie when I went out with Sandy last night $\left\{\begin{array}{c}\text{who}\\ \text{that}\\ ??\varnothing\end{array}\right\}$ you recommended.

c. How many books do you intend to donate $\left\{\begin{array}{c}\text{who}\\ \text{that}\\ ??\varnothing\end{array}\right\}$ you don't want anymore.

The behaviour of these zero-relatives is precisely what we would expect if the unacceptability is correlated with predictability of the relative clause. In fact, Levy et al. (2012) demonstrate that the processing complexity of an extraposed relative clause is dependent on its predictability. When the antecedent DP signals that there is likely to be a following relative clause, reading times after the verb are significantly faster than when the antecedent DP does not signal a relative clause: "… a preceding context (specifically, DP-internal premodifiers) that sets up a strong expectation for a relative clause modifying a given noun can strongly facilitate comprehension of an extraposed RC modifying that noun" (: 29). In (28a), the antecedent is *some people* and the predicate is relatively uninformative; note the oddity of *some people came in*. If we replace *some people* with a more informative DP, as in (30), or a more informative VP, as in (29a), the expectation for the relative and hence the zero-relative is lower, and the judgment is one of slightly greater unacceptability.

(30) The people who were singly loudly came in $\left\{\begin{array}{c}\text{who}\\ \text{that}\\ ??\varnothing\end{array}\right\}$ I didn't recognize.

Similarly, if we replace the demonstrative in (29b) with the indefinite article and make the DP more informative, the expectation of a relative clause is reduced, as is the acceptability of the zero-relative.

(31) I saw a wonderful movie last night $\left\{ \begin{array}{c} \text{who} \\ \text{that} \\ ?\varnothing \end{array} \right\}$ you recommended.

Along related lines, Hawkins (1994, 2004) has argued that more complex alternatives tend to be avoided more by speakers and hence are less frequent in corpora. To support this point, he cites Quirk's (1957) study of extraposed and non-extraposed relative clauses in English. The relevant data is reproduced in (32).

(32) a. Restrictive (non-subject) relatives adjacent to the head (n = 548)
WH = 28% (152) *THAT* = 32% (174) *ZERO* = 41% (222)
b. Restrictive (non-subject) relatives with intervening material (n = 62)
WH = 50% (31) *THAT* = 44% (27) *ZERO* = 6% (4)

These data show two things. First, as predicted by Levy, et al., the extraposed relatives are less frequent than the non-extraposed relatives—they are 10% of the total relatives. Second, the extraposed zero-relatives are far less frequent than the non-extraposed zero-relatives—they are 4% of the extraposed relatives. Quirk does not distinguish between relative clauses extraposed to the end of the DP (some of which we looked at in connection with stacking in § 3) and relative clauses extraposed out of DP. But in an unpublished study of the Brown corpus reported by Hawkins, Lohse (2000) found that the occurrence of zero-relatives non-adjacent to the head and internal to DP constitutes 28% of the total while extraposed zero-relatives constitutes 6% of the total (1 of 18). It is natural to attribute the relatively lower frequency of extraposed relatives to greater processing complexity.

To summarize, even though some extraposed zero-relatives may be judged as acceptable, there is evidence that suggests that this construction falls together with those considered in preceding sections. The extraposed zero-relatives are not as strongly unacceptable as the zero-relatives involving left adjunction; I suggest that predictability based on the semantic properties of the antecedent DP may in part account for this variability.

5. Sentential Subjects of Relative Clauses

As we have seen, the identity of the zero-relative can be partly obscured by left-adjunction § 2, by stacking and non-parallel coordination § 3, and by

extraposition § 4. In this section I consider ways in which the structure of the zero-relative itself may obscure identification. In particular, the form of the subject of the relative clause plays a role in leading the processor to project a zero-relative structure.

In the canonical case of a zero-relative, shown in (33), the subject is a DP. The left edge of this DP is marked in boldface.

(33) a. a recipe **I** created t_i
b. a recipe **people** really dislike t_i
c. a person **the** government is interested in talking to t_i
d. a woman **many** people feel t_i should be the next President
e. a person **everyone** who $t_i$likes classical music

It is plausible that when the processor encounters one of the most frequent signs that immediately adjacent to the head N there is a DP, it assigns significant probability to the zero-relative parse.

However, there are non-canonical possibilities for subjects as well. These include *that*-clauses, *for-to* infinitives, embedded questions and gerunds. All of these are less acceptable in zero-relatives, in comparison with (33), as seen in (34)–(37). I pair the zero-relatives with *wh*-relatives for purposes of comparison, since in some cases even these are less than fully acceptable. Note that in some of the cases, e.g. (37a), there is a plausible parse that treats the subject of the relative clause as a constituent of the preceding constituent.

(34) *that*-clause
a. *Otto appears to be a man [∅[$_S$ that it is snowing hard] apparently doesn't bother t].
b. ??Otto appears to be a man [who [$_S$ that it is snowing hard] apparently doesn't bother t].
c. Otto appears to be a man [(who) it apparently doesn't bother t [$_S$ that it is snowing hard]].

(35) *for-to* infinitive
a. *Colette is the kind of woman [∅[$_S$ for us to speak better French would probably have pleased t].
b. ?Colette is the kind of woman [who [$_S$ for us to speak better French] would probably have pleased t].
c. Colette is the kind of woman [(who) it would probably have pleased t [for us to speak French better]].

(36) embedded wh-question
a. *We interviewed a candidate [∅ [$_S$ whether it is polite to make eye contact apparently was not obvious to t].

b. ?We interviewed a candidate [who [$_S$ whether it is polite to make eye contact] apparently was not obvious to *t*].
c. We interviewed a candidate [who [it apparently was not obvious to *t* [whether it is polite to make eye contact]].

(37) gerund
a. *I don't know anyone [∅ [$_S$ speaking better French] wouldn't appeal to *t*].
b. I don't know anyone [who [speaking better French] wouldn't appeal to *t*].

All of these examples with embedded complex subjects are quite unacceptable. This is to be expected, given accounts such as Gibson (1998), who shows that integrating syntactic material becomes more difficult as the complexity of what is to be integrated over increases. (See Ross, 1967, and Kuno, 1973, for earlier descriptive observations along related lines.) However, when there is no relative marker, the sentences are virtually unintelligible.

While the a-examples in (34)–(37) may appear at first reading to be completely unacceptable, it should be pointed out (and some readers may have already noticed) that with the right prosody it is possible to signal that there is a following zero-relative. The intonation appears to be a H*L falling tone on the head noun and a juncture immediately after the noun.

(38) I don't know anyone _ speaking better French (to) wouldn't appeal to
H*L

This is precisely what we would expect if these sentences are not ungrammatical, but simply difficult to parse. Intonation serves as a cue for the upcoming structure; such a cue is not available in written examples.

6. The Competence-Performance Distinction

To summarize, I have presented data that shows that the unacceptability of a range of zero-relatives is not a matter of competence, but of performance. The unacceptability judgments can be plausibly attributed to the difficulty of identifying zero-relatives as such when they are not immediately adjacent to their heads and when they don't display canonical sentential structure.

I conclude with some speculations about the implications of this data for the competence-performance distinction. To review briefly, competence is knowledge of language, and performance is the use of such knowledge in actual communication (Chomsky, 1965: 4–5). Competence comprises the knowledge of what strings of words are well-formed expressions in the language, what their structures are, and how they are interpreted. The standard

view in syntactic theory has been that competence is responsible for and revealed by grammaticality judgments.

On the other hand, performance is about what speakers actually do with language in "concrete situations" (Chomsky, 1965: 4), and reflects not only knowledge of language, but properties and limitations of the mechanisms used for speaking and understanding. The standard view has been that performance is responsible for and revealed by acceptability judgments and other measures, such as reading times and eye-movements.

The competence-performance distinction was highlighted by Chomsky and Miller (1963). They pointed out that otherwise well-formed relative clauses become increasingly less acceptable as the amount of self-embedding increases, along the lines of (39). While (39b) with one embedded relative clause is understandable, (39c) with two embedded relative clauses is virtually impossible to understand.

(39) a. The rat ate the cheese.
b. The rat [that the cat bit] ate the cheese.
c. The rat [that the cat [that the dog chased] bit] ate the cheese.

Since the relative clause configuration in (39c) is itself unproblematic, as shown by the grammaticality of (39b), the unacceptability of (39c) must be attributed to something other than knowledge of language per se. It is thus plausible that the problem with (39c) is one of performance, although the precise explanation remains at issue (see Gibson, 2000; Lewis, 1997).

Perhaps the most critical aspect of the competence-performance distinction is that the judgments themselves do not come labelled as to their source (Hofmeister et al., submitted). The subjective experience of ungrammaticality is indistinguishable from that of unacceptability. So it is necessary to reason from the pattern of judgments to a conclusion about their source on the basis of assumptions about how grammaticality and acceptability judgments are arrived at. There are some relatively clear cases of unacceptability due to performance, e.g. self-embedding of relative clauses.

However, there are numerous cases that have been attributed to competence for which the actual source of the judgments must be reconsidered. It has in fact been argued in recent literature that when judgments are graded, they are the consequence of performance factors. The reasoning is that since performance makes use of computational resources such as memory, variations in the resource requirements should produce differences in processing complexity, and therefore acceptability differences. An early argument along these lines was made in Jackendoff and Culicover (1972) (reprinted in Culicover, in press), to account for the unacceptability

of sentences like *??Who did you give the book?* Similar arguments have been made more recently for a range of island constraints; see Kluender, 1998, 2004; Sag et al., 2007; 2008; Hofmeister and Sag, 2010; Staum Casasanto et al., 2010; Hofmeister, 2011. Culicover and Winkler (2010) and Hofmeister et al. (2012) argue that certain "freezing" effects are properly to be accounted for in terms of processing, and not in terms of grammatical constraints.

Underlying this work is the idea that processing complexity is responsible for unacceptability judgments. As I suggest above, as well as in Culicover (2013), one way to understand the connection between complexity and judgments is that the judgments reflect frequency of experience with the construction, and complexity is one of several factors that determine complexity. There is a causal chain from complexity, to lower frequency of production, to less familiarity on the part of learners, to judgments of greater unacceptability by hearers.[4]

But given this chain, the question must be raised: Could lower frequency explain all unacceptability judgments? In some cases, lower frequency would be due to processing complexity, as we have been discussing. In other cases, it could be due to historical change or be purely accidental, a scenario that I argue for in connection with a number of "syntactic nuts" in Culicover (1999). On this view, the reason why (40a) is acceptable for some speakers and (40b) is not is simply that (40b) happens not to in their experience.

(40) She was thinking,
  a. … but I don't know what about.
  b. ? … but I don't know who about.

At this point, it is natural to ask, If a string or a structure does not occur, isn't that the same as ungrammaticality? But notice that the reason that we are on a slippery slope in thinking about competence and performance is that we are dealing with a continuum, where non-occurrence is simply the extreme of low frequency. If low frequency is responsible for unacceptability, then there is no reason to doubt that non-occurrence is also responsible for unacceptability. Unacceptability due to "ungrammaticality", on this view, may simply arise in those cases where a form fails to satisfy conditions imposed by the grammatical constructions of the language, and hence fails to occur in the experience of the learner. Unacceptability due to performance, on the other hand, concerns low or zero occurrence

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[4] However, gradient judgments have also been taken to be the consequence of "graded grammaticality" (Sorace and Keller, 2005; Keller, 2000, 2006; Fanselow et al., 2006).

in the experience of the learner due to factors such as processing complexity.

Drawing the line between competence and performance in this way raises the possibility (or even necessity) of explaining in processing terms phenomena that previously have simply been stipulated, e.g. as "rules", "principles" or "constraints". This would of course be a major challenge. In syntax, at least, there are vast multitudes of judgments that have been assumed without question to reflect knowledge of language, not how the language is processed. Whether or not there is an empirical distinction between competence and performance, we cannot escape the burden of explaining how language works. We need to explain why some constructions are more complex than others. We need to explain why some linguistic patterns occur widely in natural languages, while others are highly idiosyncratic, and others are impossible (or at least, non-existent). We need to understand the role of language change in determining the form of languages. The burden is then shifted from some abstract and inclusive notion of "grammar" to an comparable notion of a "performance mechanism", albeit one that may have realistic computational and cognitive foundations.

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