

English auxiliary contraction as a
two-stage process:
Evidence from corpus data

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John *is* ~ 's at home

I *will* ~ 'll be there

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I'm reporting today on a quantitative study of English auxiliary contraction, that is, the alternation between such forms as 'is' and its contracted variant [z] and 'will' and its contracted variant [l].

John *is* ~ 's at home

I *will* ~ 'll be there

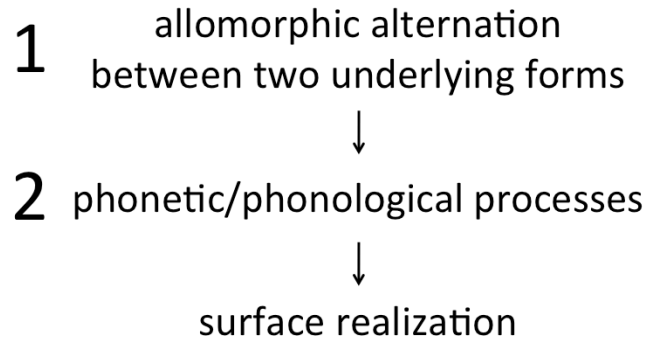
What processes generate surface realizations?

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Specifically, I'm examining the constraints conditioning this alternation between full and contracted forms, with an eye to determining what grammatical processes must be governing this alternation.

There's a lot of formal work on contraction out there, but it's been based almost exclusively on intuitions rather than on data from natural speech. So I'm taking work on this variable in a new direction by examining quantitative data for patterns that can help us determine what grammatical processes are involved in the contraction alternation, and where in the grammar they may be located.

Two-stage analysis



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I'm going to end up arguing today that the quantitative data on contraction lend themselves to a two-stage analysis of the phenomenon. My take on this variable is that previous analyses of contraction as an allomorphic alternation between two distinct underlying forms can be upheld, but one novel contribution of the corpus data is that this alternation is followed by subsequent low-level phonetic or phonological processes that also contribute to the surface realization of auxiliaries that is found in natural speech.

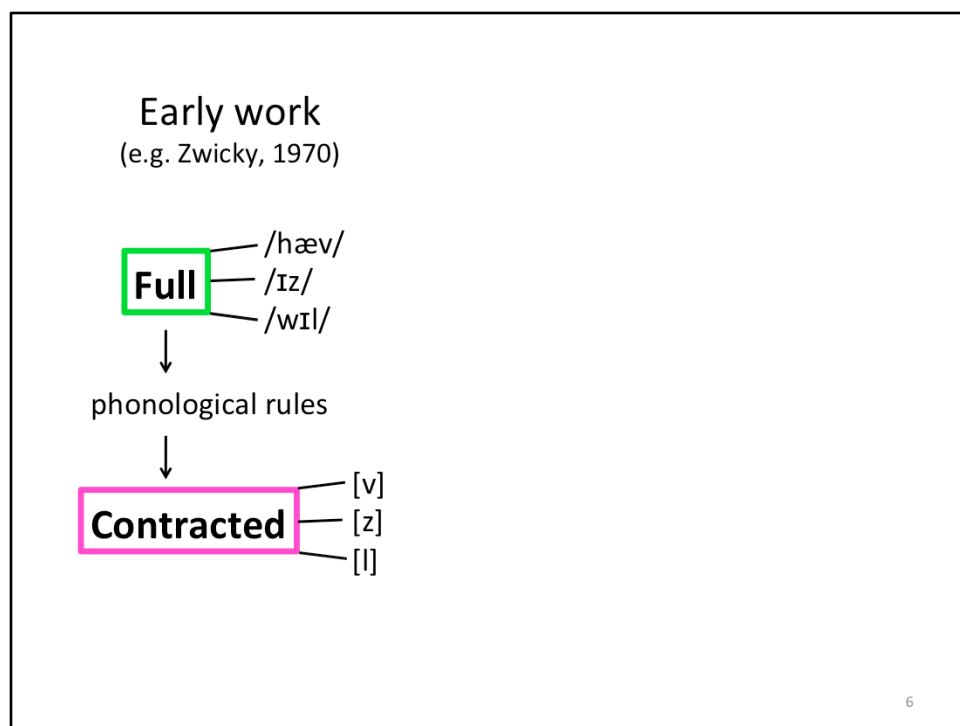
1. Previous analyses
2. Auxiliary forms
3. Two stages of contraction
4. Subject length

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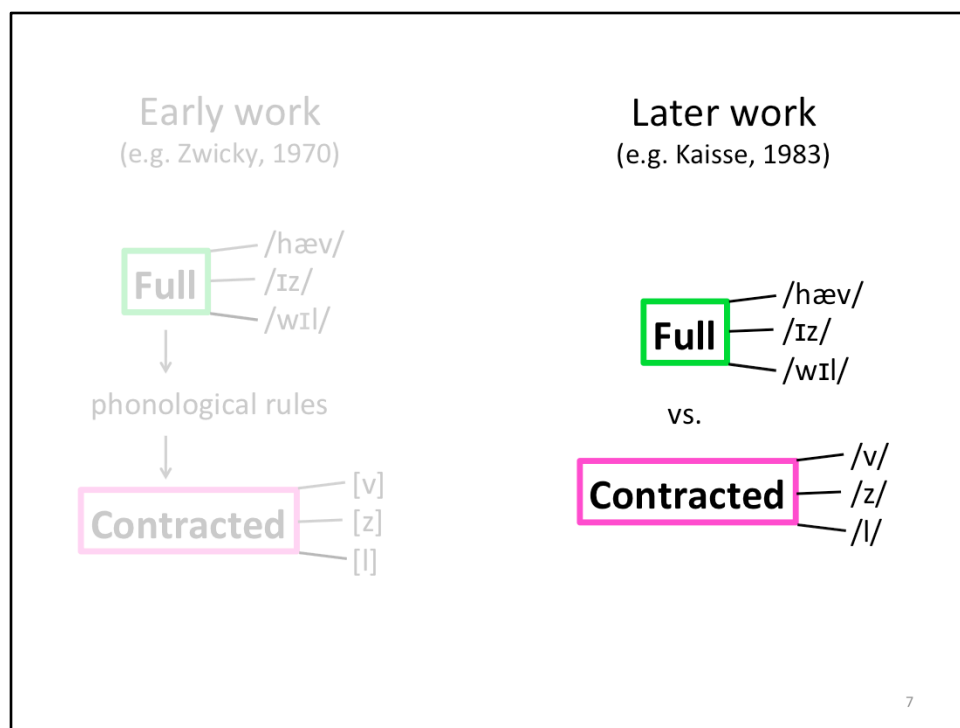
I'll work up to this analysis by first giving you an overview of previous analyses of contraction that have been put forward in the literature.

Then I'll lay out the various forms auxiliaries are found to take in the corpus data I've collected, and provide an analysis of those forms which haven't received attention in the literature before, an analysis which crucially relies on contraction being a two-stage process.

I'll then support this analysis with data from a study of the effect of the length of an auxiliary's subject on contraction rate, and close by speculating a little on the nature of the observed subject length effect and its implications.



I'll start with a little background on contraction in the linguistic literature. Early work on contraction modeled full forms – such as have, is, or will, which I'll be color-coding throughout this talk as green – as the sole underlying form of an auxiliary, regardless of its surface realization. Contraction was then attributed to the application of variable phonological processes on these full forms, outputting contracted variants, which I'll be color-coding as pink.



But since Kaisse's work in the '80s, formal work on contraction has mostly abandoned this analysis for one that treats full and contracted forms as distinct allomorphs underlyingly, rather than having the latter derived from the former.

Kaisse then models contraction as variable morphosyntactic adjunction of an auxiliary to its host. I'm roughly schematizing this as follows:

$X \text{---} \text{Aux} \rightarrow [[X]\text{Aux}]$

$\text{Aux} \leftrightarrow \underline{/v/, /l/, /z/...}$

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a host, and I'm using X here to stand in for the final item in a noun phrase, and the auxiliary that's immediately adjacent to it, variably become adjoined. Adjunction, when it occurs, conditions insertion of the contracted form of the auxiliary in question – which I'm assuming is just a single consonant with no vocalic material.

X^{\sim} Aux

Aux \leftrightarrow /hæv/, /wɪl/, /ɪz/...

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When adjunction doesn't occur, the full form is inserted by default.
To spell this out with a sample derivation:

$3.\text{sg} \sim T_{[\text{fut}]}$	\rightarrow	$[[3.\text{sg}]T_{[\text{fut}]}]$	adjunction
		$[[jɪ]l]$	allomorph selection
		$[ʃɪ]_{\sigma}$	close phonology
	cf. <i>you'll</i>	$[jʊl]_{\sigma}$	
	but		
	<i>the guy sitting next to you'll</i> * $[jʊl]$		

Let's say our host is the 3rd singular pronoun and we have a future tense auxiliary. Variable adjunction happens to occur in this demo case, conditioning the insertion of the contracted form.

I'm also assuming that in cases like this where adjunction has occurred, there's a subsequent process that enacts what I'm calling "close phonology" between the host and the auxiliary. This brings the host and the contracted auxiliary into a single syllable and conditions the application of any vowel changes, like we find here when 'she' adjoins with contracted 'will' to give [ʃɪ]. This is something that has to be sensitive to structure: we find the same close phonology between host and auxiliary with other pronouns, like "you" which contracts with "will" to give [jʊl], but not when embedded: we can say "the guy sitting next to you [ə] be there," but not "the guy sitting next to [jʊl] be there." I'll come back to this in a moment, but I'm attributing these facts to the presence of some extra structure, like a prosodic boundary, after the embedded pronoun, prohibiting this close phonology.

So the mechanics behind contraction have been more or less settled given four or so decades of formal work, but what we still don't really know is what's driving the variation.

	has	have	is	will
N =	966	761	1068	816

So to that end, I've been carrying out a corpus study of contraction. I'll be reporting today on four auxiliaries, 'has', 'have', 'is', and 'will'. The numbers of tokens of each that I've coded are given here. My data come from the Switchboard corpus, a corpus of 2400 5-minute telephone conversations between strangers. The corpus is transcribed, but all my coding is based on the audio. In coding the dependent variable of auxiliary realization, I adopted a tripartite coding scheme in order to accurately capture all realizations that I found in a preliminary study of the data.

Full: CVC syllable

'have': [hæv], [həv]
'will': [wɪl], [wəl]
'has': [hæz], [həz]
'is': [ɪz], [əz]

Contracted: single consonant

'have': [v]	e.g. I've [ajv], we've [wiv]
'will': [l]	e.g. you'll [jʊl], we'll [wɪl]
'has': [z]	e.g. it's [ɪts], Jimmy's [dʒɪmɪz]
'is': [z]	e.g. it's [ɪts], Jimmy's [dʒɪmɪz]

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Full forms (in green, as before) were those that had an initial consonant and a vowel of any quality. So for 'have,' tokens coded as full were those pronounced [hæv] or [həv]. Full tokens of 'will' were those pronounced [wɪl] or [wəl], and full tokens of 'has' were those pronounced [hæz] or [həz]. For the auxiliary 'is', which has no initial consonant, any form with an audible vowel was coded as full.

Contracted forms (in pink, as before) were those that had no initial consonant and no vowel, consisting of only a single consonant that formed a syllable with its host. So 'have' was coded as contracted in cases like monosyllabic "I've" or "we've." "Will" was contracted in monosyllabic "you'll" and "we'll" and "has" and "is" were coded as contracted in cases like "it's" or "Jimmy's," where they not only form a syllable with their host but also assimilate to it in voicing.

Intermediate: əC syllable

'have': [əv]	e.g. most people [əv]
'will': [əl]	e.g. it [əl], Jimmy [əl]
'has': [əz]	e.g. Jimmy [əz]

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But in coding the data, I also found that there was a third form that was in between full and contracted, which I'm calling intermediate and coloring yellow. These were forms in which the auxiliary had no initial consonant but still retained a vowel, forming a syllable distinct from its host.

The intermediate form of 'have' is [əv], as in "most people [əv] been here for a few years"

The IF of "will" is [əl], as in "it [əl] be ready by five" or "Jimmy [əl] be here at noon" and the IF of "has" is [əz], as in "Jimmy [əz] been waiting for a while"

There was no intermediate form of 'is' separate from what I called the full form of 'is,' since that auxiliary has no initial consonant to lose.

So that's the coding scheme I'll be using throughout, and I'll have more to say about these particular forms in a moment.

It's important to be clear before we move on about which environments I coded and which were omitted from study.

I wonder where the party {is / *'s} ____ .

I'm as tall as Bill {is / *'s} ____ .

I'll get there before John {will/ *[ə]} ____ .

OMITTED

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There's been a lot of work on environments in which contraction is illicit: for instance, before a movement site: 'I wonder where the party is' but not 'I wonder where the party's',

as well as before an elision site: 'I'm as tall as Bill is' but not 'I'm as tall as Bill's'.

These are environments in which only the full form of an auxiliary can surface: contracted forms are illicit, and so are intermediate forms, for those auxiliaries that have them: we see the same effect in the unacceptable "I'll get there before John [ə]."

Given the categorical choice of form in these environments, they are outside what sociolinguists call the envelope of variation. So tokens in these environments were omitted from study.

But then there are some other environments in which the full range of possible forms – that is, full, intermediate, and contracted – isn't allowed, but variation between *two* forms is still possible.

three + have → *[θriv] (cf. *we've*)

[θri hæv] ~ [θri əv]

Sue + will → *[sul] (cf. *you'll*)

[su wɪl] ~ [su əl]

RETAINED

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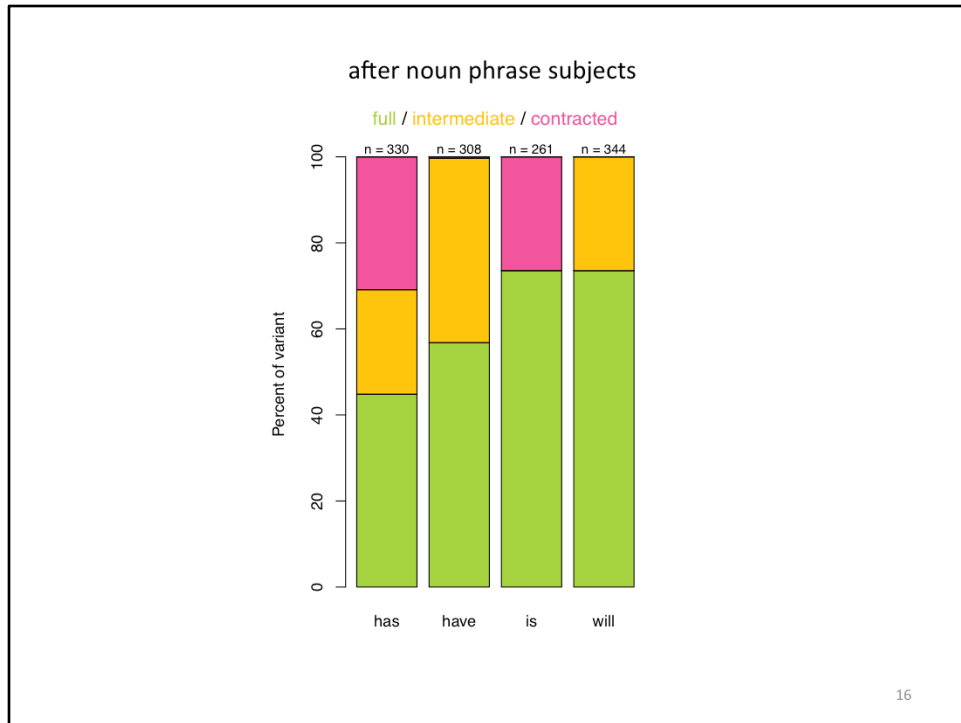
I'm referring specifically to cases where the auxiliaries 'have' and 'will' surface after noun phrases, so cases like "three have" and "Sue will."

Contraction here is not acceptable: [θriv] on analogy with "we've" and [sul] on analogy with "you'll" are ungrammatical.

But **intermediate** forms of these auxiliaries still surface in alternation with full forms: 'three have' alternates with 'three [əv]', and 'Sue will' alternates with 'Sue [əl]'.

So these environments WERE retained in the current study, because some degree of variation in auxiliary realization can occur. And you'll see in a moment that the empirical data confirms my judgments of acceptability here.

Now most work on contraction has ignored the sort of environment exemplified here, because that work has been concerned only with where **contracted** forms can surface. But when you actually look at corpus data, you see that these post-noun phrase environments do in fact display variation in natural speech, so a proper treatment of auxiliary realization needs to take them into account.



This graph shows the percentage of each of the three possible realizations, color-coded as before, for the four auxiliaries under study after non-pronoun subjects (which I'll be calling "noun phrase subjects" from here on out). You can see that intermediate forms are well-represented, meaning that they can't be ignored in any study that seeks to propose a mechanism of auxiliary realization. Since my coding of them as "intermediate" is purely a description, not an analysis, the next step here is to identify what their source is:

$X^{\sim} \text{Aux} \sim [[X]\text{Aux}]$

$\text{Aux} \Leftrightarrow \underline{/v/, /l/, /z/...} / [[X]_]$

$\text{Aux} \Leftrightarrow \underline{[\əv], [\əl]...} / ???$

$\text{Aux} \Leftrightarrow \underline{/hæv/, /wɪl/, /ɪz/...}$

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Is contraction actually a three-way competition for insertion among contracted, intermediate, and full forms, or can we instead explain away intermediate forms, allowing us to preserve the bipartite alternation presented before?

I'm going to argue in favor of the second explanation: intermediate forms are just an artifact of low-level processes that occur after the full/contracted alternation. So I'm now going to walk through my analysis of these intermediate forms, and then support that analysis with findings from the subject weight study.



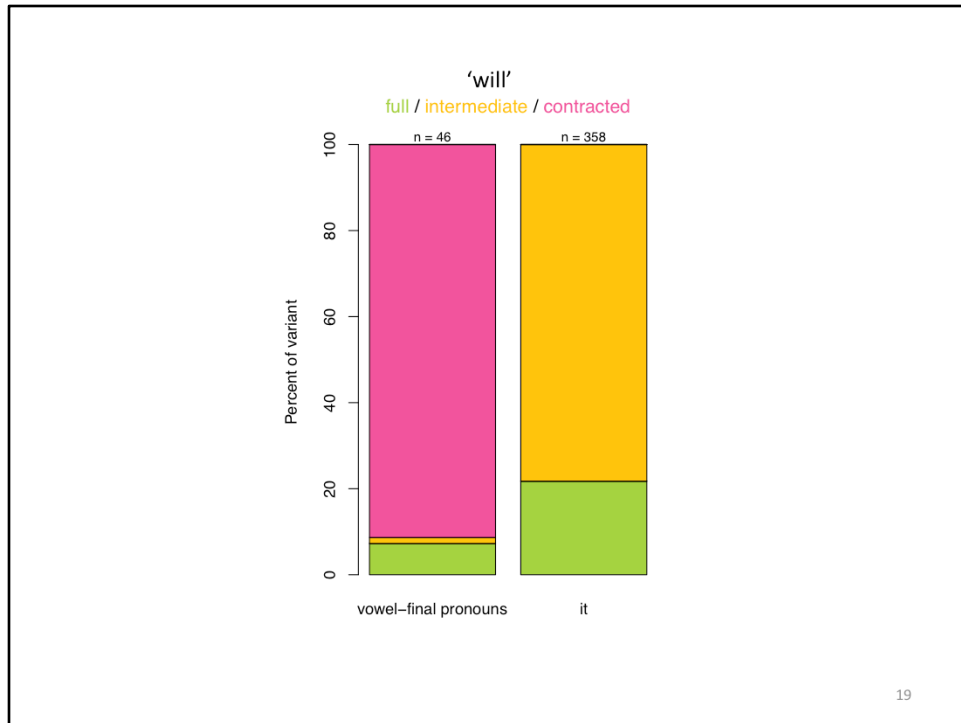
Now, if we go back to the previous graph, you can see that the environments in which intermediate forms surface can be classified into two groups:

In the case of post-noun phrase ‘has’, intermediate forms and contracted forms are both acceptable.

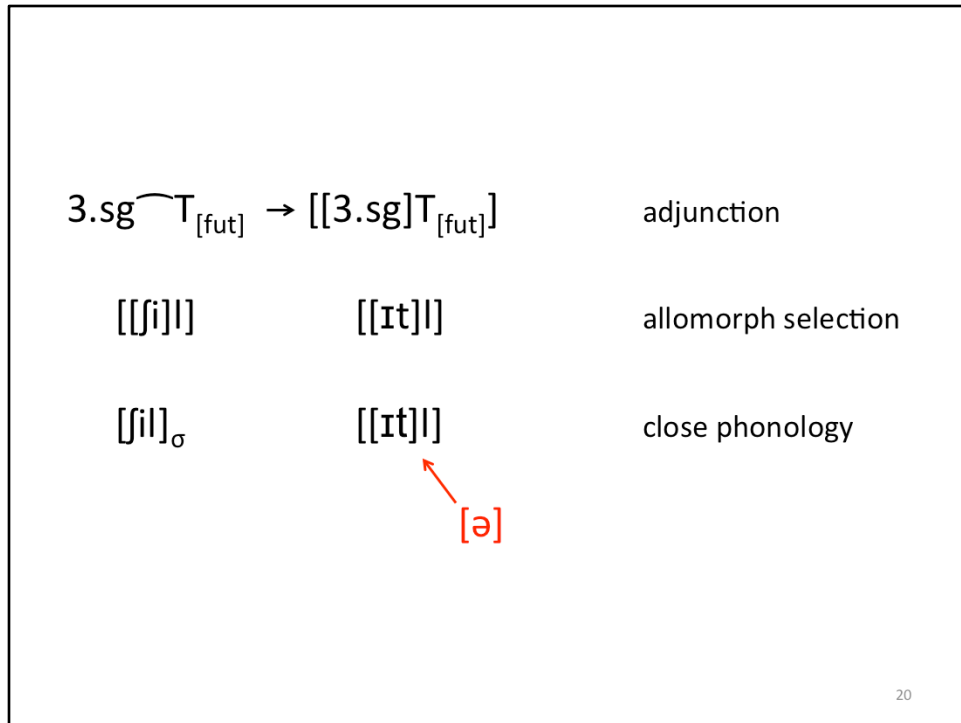
In the case of post-noun phrase ‘have’ and ‘will’, contracted forms are not ok, as we just demonstrated with the ungrammatical [θriv] and [sul].

Based on this distinction, I’m going to argue that intermediate forms in the former and latter groups come from different sources: that is, there are two distinct ways of deriving intermediate forms. Specifically, in the first case, intermediate forms are underlyingly full; in the second case, intermediate forms are underlyingly contracted. I’ll start by talking about these latter cases in which contracted forms are not acceptable on the surface.

Now an important thing to recognize here is that just because an auxiliary doesn’t surface in its contracted form in a particular environment doesn’t mean that contraction qua morphosyntactic adjunction hasn’t occurred. Compelling evidence for this comes when we look at the auxiliary ‘will’ after pronouns.

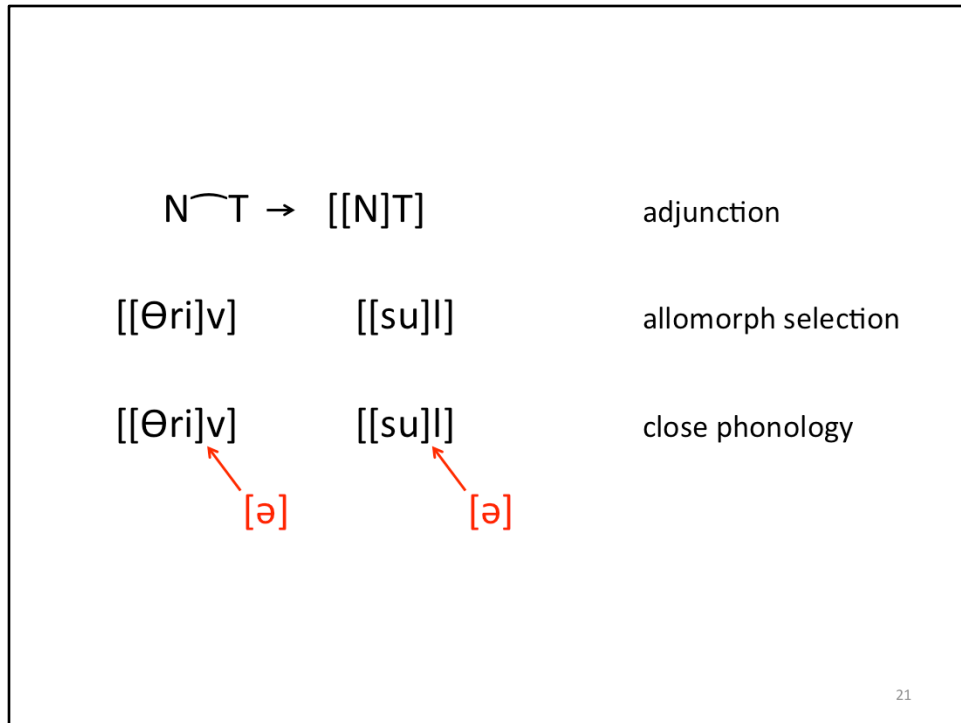


On the left here, we have the realization of 'will' after vowel-final pronouns: it surfaces in its contracted form (e.g. I'll, you'll) about 90% of the time. On the right, we have 'will' after the pronoun 'it': surfacing about 80% of the time in its intermediate form. You can't get contracted forms of 'will' after 'it' given English phonotactics. But what you do get looks like complementary distribution of intermediate and contracted forms across the different phonological environments.



We can explain this by appealing to the model of contraction we set up earlier, in which adjunction is followed by allomorph selection and close phonology. Assume that adjunction is just as likely to happen after vowel-final pronouns as after ‘it’. If adjunction occurs in both ‘she’ll’ and ‘it’ll’, conditioning the insertion of the single-consonant contracted form, close phonology will try to occur, to bring the host and auxiliary together into a single syllable. It will succeed in ‘she’ll’ but fail in ‘it’ll’. I propose that there’s then a repair process of schwa-insertion that comes in to rescue the contracted form, giving it vocalic material where it can’t syllabify. This can explain why ‘she’ll’ and ‘it’ll’ occur at roughly the same rate: morphosyntactic adjunction and contracted-form insertion apply regardless of host, they just get different outputs on the surface.

So this is one source of intermediate forms: schwa-insertion before contracted forms where close phonology can’t occur.



Now, I'm going to extend this analysis of intermediate forms to all cases in which contracted forms can't surface. This means, not only after 'it', but also after vowel-final noun phrases. When we see forms like "three [əv]" or "Sue [əl]" which have no contracted counterparts [θriv] and [sul], what we could be seeing is just the contracted form failing to undergo close phonology, with a schwa-insertion repair. So, just like in 'it'll,' adjunction occurs, but close phonology fails, and schwa is inserted as a repair to "save" the contracted form.

An obvious question is why you can't do close phonology here, and my guess is that it's related to the reason why it also fails in "the guy sitting next to you'll be there" – an embedded pronoun and a noun phrase both have some large amount of prosodic structure after them, enough to block this close getting-together of the host and the auxiliary. What's crucial here is that just because this step fails doesn't mean adjunction and contracted form insertion haven't occurred in the first place.

[ə]-insertion

it + /l/ Sue + /l/ three + /v/
↓ ↓ ↓
it + [əl] Sue + [əl] three + [əv]

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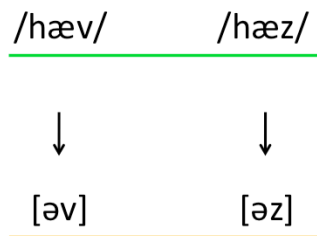
So to sum up this first part of the analysis, we have one source of intermediate forms: a process of schwa-insertion that applies when a contracted form is inserted but fails to undergo close phonology with its host: for phonotactic or other reasons.



But, going back to the post-noun phrase graph from before, we also see intermediate forms in environments in which contracted forms ARE acceptable: namely, when the auxiliary ‘has’ follows a noun phrase subject. ‘John’s’, ‘John [əz]’, and ‘John has’ are all acceptable. So where are THESE intermediate forms coming from?

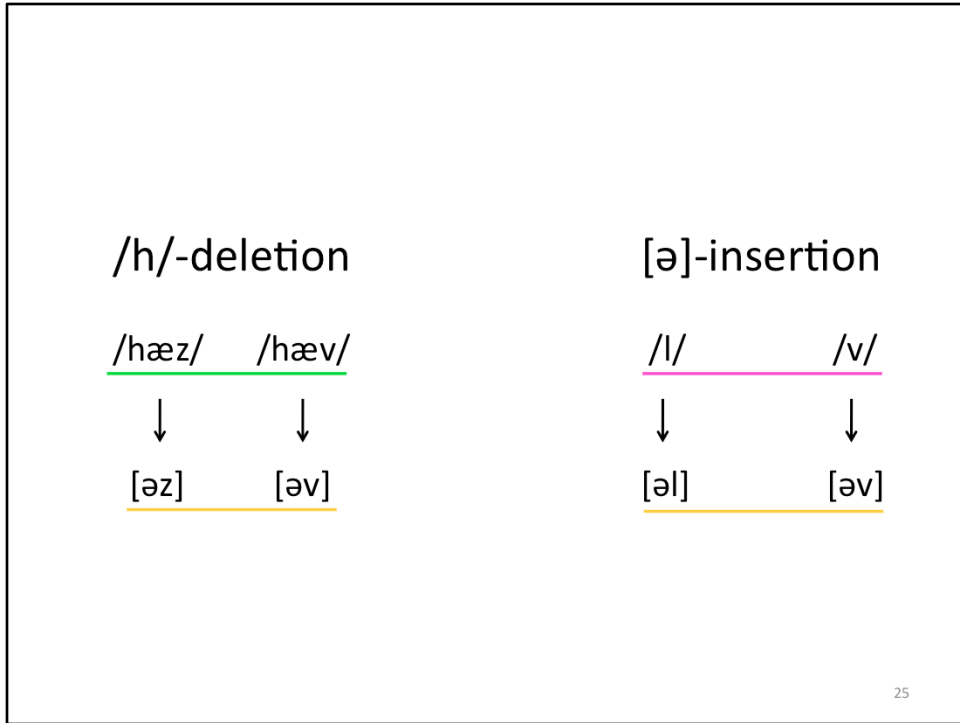
If the same thing is going on here that we proposed for intermediate forms of ‘will’, these intermediate forms are generated from contracted forms that fail to undergo close phonology with their host, and get a schwa inserted. But contracted forms of ‘has’ clearly can undergo close phonology with their host: that’s why we get John’s. Instead, I’m going to argue that these intermediate forms have a different source altogether: they actually come from full forms that have lost their initial consonant. So Kaisse (1985) describes a process of fast-speech h-deletion which affects pronouns and function words, giving, for instance, ‘did ‘e do it’ and ‘talking to ‘im yesterday’.

/h/-deletion: full → intermediate

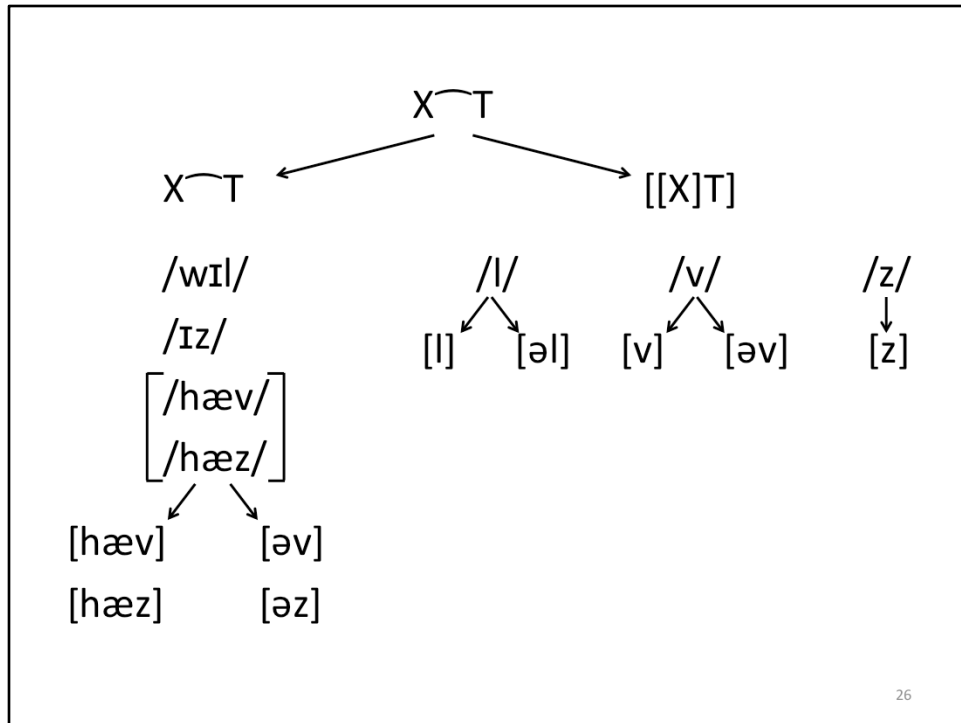


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Combined with another process of vowel reduction to schwa, which is also well-attested in function words, this h-deletion gives us another way of deriving intermediate forms, this time from full forms of h-initial auxiliaries.



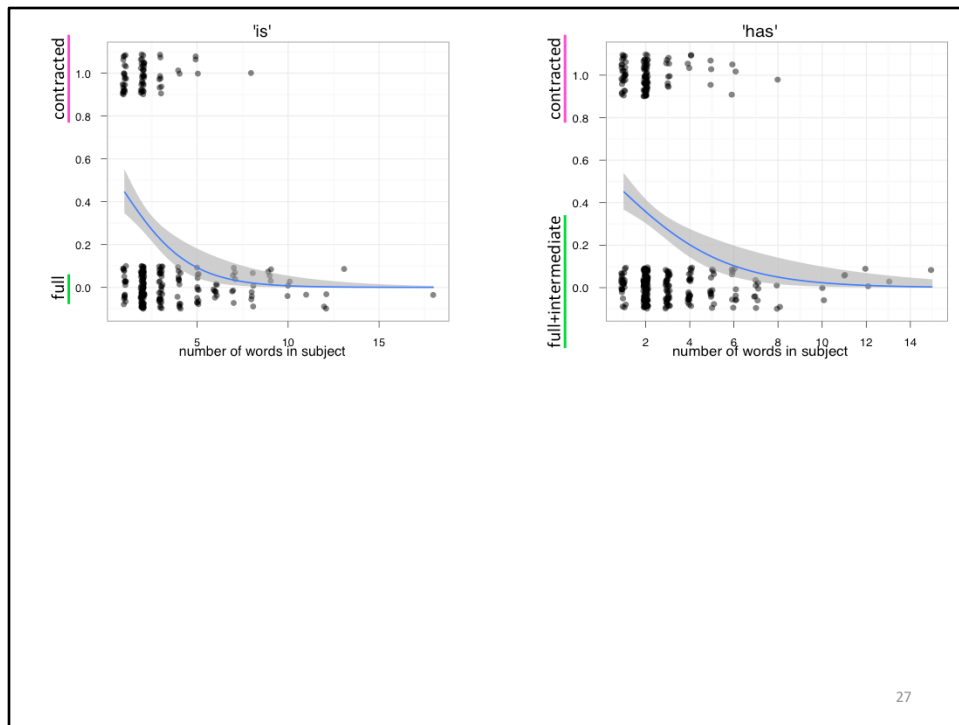
So we now have two sources of intermediate forms: fast-speech h-deletion on full forms, and schwa-insertion for syllabification purposes on contracted forms. So we can schematize the various possible auxiliary realizations after noun phrases as follows:



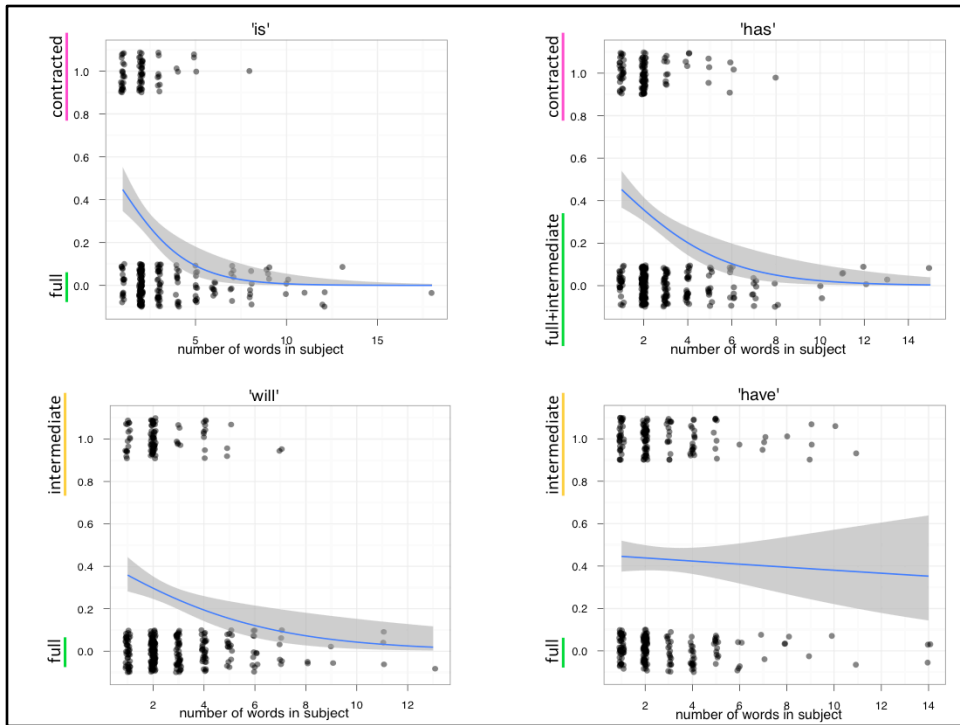
Given an adjacent host and auxiliary, when variable adjunction doesn't occur, full forms of an auxiliary are what is inserted. An h-initial full form then either surfaces as-is, or, if a variable process of h-deletion applies, as intermediate.

When variable adjunction does occur, contracted forms are inserted and close phonology tries to apply. Contracted forms of 'will' and 'have' successfully undergo close phonology after pronouns to surface as-is, but require schwa-insertion after noun phrases, where they surface as intermediate. Contracted forms of 'is' and 'has' successfully undergo close phonology regardless of host, and surface as-is.

So we've managed to condense a tripartite opposition of auxiliary realizations on the surface into a bipartite opposition underlyingly.

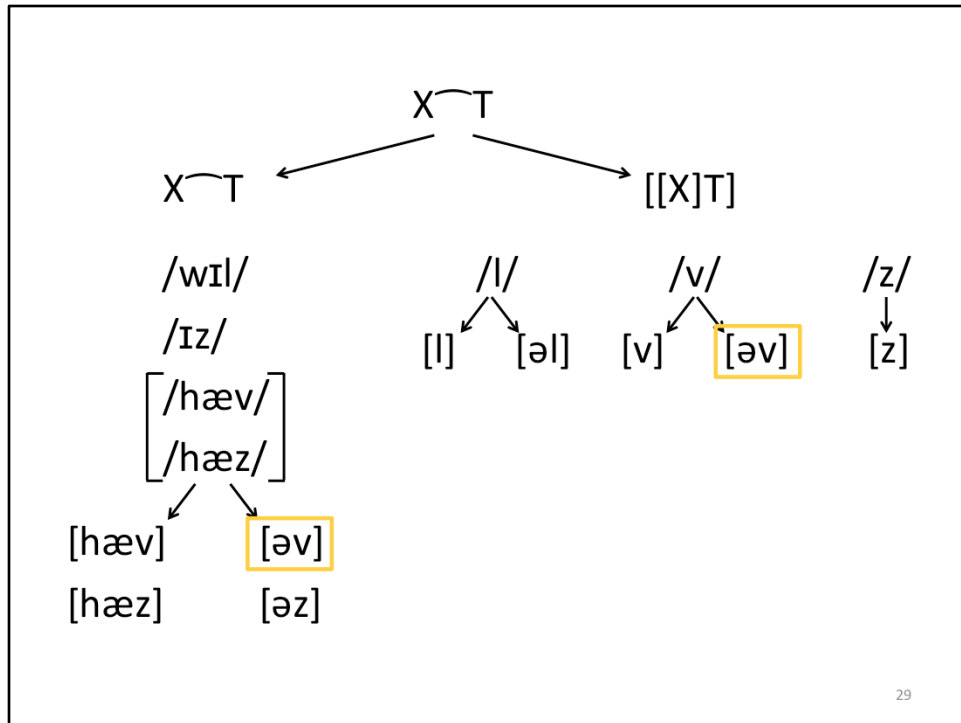


Now, the model of contraction I'm presenting here attributes all surface realizations of auxiliaries to the variable application of this morphosyntactic rule of adjunction. So any factors that condition the probabilistic application of this rule will manifest in whatever an auxiliary's surface realization of full and contracted forms is. This is where the subject weight study comes in. The study is predicated on the hypothesis that the longer or heavier an auxiliary's subject, the less likely that auxiliary will be to contract, or, in other words, to display whatever its surface manifestation of underlyingly contracted forms is. So, to that end, I coded every post-noun phrase auxiliary in my data for the number of words in its subject. Then, for each auxiliary, I opposed what by hypothesis is the surface manifestation of the full form to the hypothesized surface manifestation of the contracted form. I'll walk through the four auxiliaries under study one at a time. This graph shows full forms of 'is' opposed to contracted forms of 'is', with one point for each token coded, by the number of words in the subject. You can see pretty clearly that the number of contracted forms tapers off the longer the subject gets. So, there is definitely a subject length effect on contraction for this auxiliary. This is upheld for 'has' as well, where I've opposed contracted forms to full and intermediate forms (as intermediate forms are analyzed as being underlyingly full, having undergone h-deletion). Again, the longer the subject, the less likely you are to get contraction.

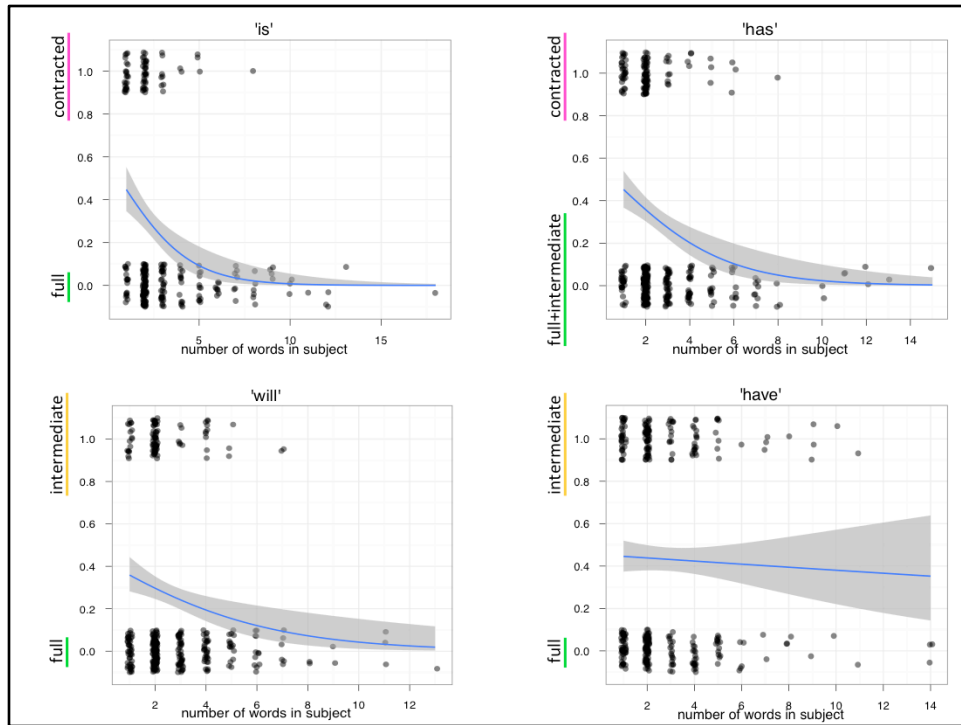


And again with 'will', the same pattern is upheld. This time, the graph opposes *intermediate* forms of 'will' to full forms, and again, intermediate forms of 'will' are less likely with longer subjects – as we'd expect if those intermediate forms are underlyingly contracted.

But the pattern shown by intermediate forms of 'have,' which are graphed here in opposition to full forms, is completely different from the others. And under my analysis of those forms, this makes sense.



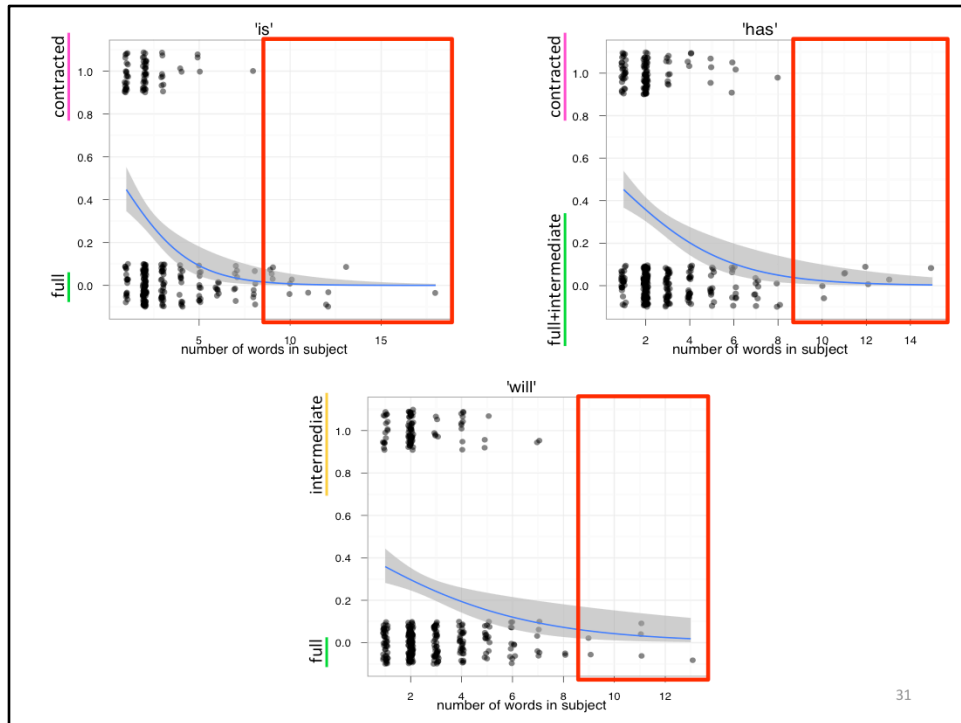
If we go back to the chart from before, you can see that there are actually two sources of intermediate forms of 'have': full forms that lose their 'h' via fast-speech h-deletion, and contracted forms that undergo schwa-insertion when they follow a noun phrase subject. There's no way to separate these forms of ambiguous origin on the surface.



And when we oppose them to surface full forms, as I did here, there's no indication that they show the same subject length effect.

So this is a nice finding, because it provides confirmation that this treatment of intermediate forms must be correct. When intermediate forms are underlyingly contracted forms, they decline in use with longer subjects; when they're underlyingly full, they don't.

But the fact that there is this subject length effect on contraction is interesting in itself, so I want to say a few words about that before I close.



So if we take a closer look at just those auxiliaries that unambiguously show the subject weight effect in their surface forms, you can actually see that variation between full and contracted forms is only in evidence up to and including subjects of 8 words in length. Once a subject exceeds 8 words, contracted forms are unattested. You can see this effect here with the auxiliary 'is', and it's also replicated with 'has' and also with 'will'.

- Why a cut-off at 8 words?
- What unit of length is words a proxy for?
- Where is this effect localized?

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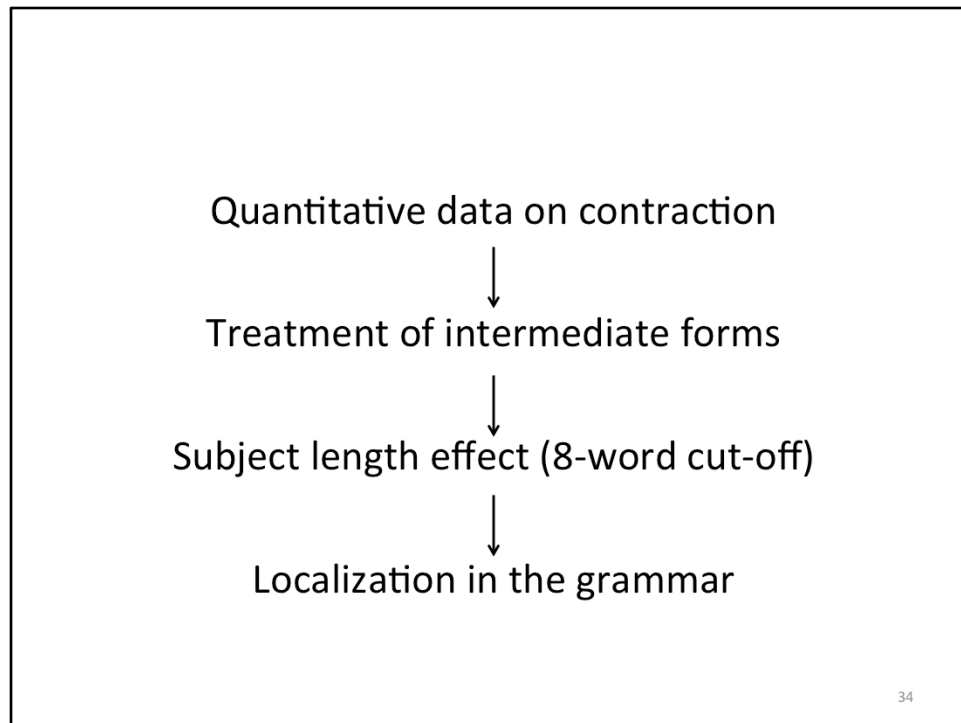
So this raises a bunch of new questions about the precise nature of the subject length effect. For instance, why is the cut-off so clearly at 8? Does this have anything to do with the alleged limit on short-term memory being “7 items \pm 2”?

Additionally, the plots I just showed you were based on the number of orthographic words in a subject, but orthographic words aren't really a linguistic unit, so there's the question of what unit of length or weight orthographic words are serving as a proxy for – so, what unit is actually responsible for this effect: Is it phonological words, is it duration, is it intonation contours... I'm open to suggestions and I am planning to look more into this in future work.

- Why a cut-off at 8 words?
- What unit of length is words a proxy for?
- Where is this effect localized?

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Finally, this effect of subject length, particularly the 8-word cut-off, raises some interesting questions about where it should be localized in our model of contraction. The plots we saw on the previous slide made the condition look black and white: once a subject exceeds 8 words in length, contraction doesn't happen. But it's important to recognize that, as far as I know, there are no attestations of *categorical* alternations that are conditioned by a number as specific as 8: the grammar just doesn't count like that. So it seems that if we were to incorporate this 8-word effect as a condition on our morphosyntactic rule of adjunction, we'd be opening up grammatical possibilities that are actually unattested. So another direction I'm taking in my work in progress is to examine whether a variable alternation like contraction is actually the purview of a different system – let's call it usage – than the one that generates forms that alternate categorically – let's call that one grammar. The usage system would have to be something that can be sensitive to a conditioning factor like "8 words," but crucially, the grammar could not be, and this would explain why we can find an effect like precise number of words conditioning *variable* phenomena, but never categorical ones. So this just gives you an idea of where I'm going next.



So I'm just going to close by quickly summing up what I've discussed here today. I've carried out a quantitative corpus study of contraction, taking into account what I've called intermediate forms. I've shown that, given judicious treatment of these intermediate forms, a subject length effect emerges in the data, by which contracted forms are disfavored after longer subjects, with an apparent 8-word cut-off after which there is no contraction. And this opens up a new array of questions concerning where such an effect may be localized in the grammar, and whether categorical and variable alternations may actually be the purview of different systems that are not subject to the same conditioning factors.

Thank you!