Just listen: Describing phonetic variation in the word *just*

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Abstract

This study analyses the phonetic variation of the word *just* according to its pragmatic function and surrounding context. Analysis was made of the realisation of its four canonical segments (in Standard Southern British English or SSBE these are /d͡ʒ/, /ʌ/, /s/ and /t/) alongside duration, centre of gravity and formant measures. It was found that tokens of *just* with a discourse function are more likely to exhibit phonetic reduction than adverbial tokens. For instance, discourse *just* has shorter and centralised vowels and a higher rate of vowel and /t/ elision. This suggests that speakers signal different functions of *just* via segmental realisation. Analysing *just* in phonetic detail within its pragmatic and contextual environment describes how the word is shaped in its representation. Understanding the phonetic detail of words helps describe their patterns of social variation.

Index Terms: discourse-pragmatic variation, acoustic phonetics, segmental phonology

1. Introduction

Discourse-pragmatic variables (DPVs) are complex polyfunctional linguistic items which serve to "express speaker stance; to guide utterance interpretation and to structure discourse" [15, p.4]. They include markers (*like, yeah, just*), phrases (*you know, I mean*), interjections (*ah, oh*) and longer strings. Their structural and interactional patterning has been analysed by referring to frequency of use, functions, grammaticalization processes, and social variation. The properties of DPVs also vary according to function and prosodic context, as has been shown with *like* [10,11,18]. However, it is rare for these discourse features to be analysed phonetically, even though word-level variation is important in understanding social patterns of production [12]. *Just* has been studied with a focus on its various discourse functions and overall frequency of occurrence. Adverbial functions of *just* ('to be precise' and 'to reference the recent past') are pragmatically distinct from emphatic (restricting / intensifying meaning) or planning (when used as a 'filler') functions [1,2,4]. Phonetic variation of *just* has not been the subject of detailed study, with the exception of [8]. The present study compares phonetic variation across pragmatic functions and segmental contexts of *just*. The study thus contributes to a growing body of work which analyses phonological patterns via individual words in context [12,16]. As assumed by exemplar theory, words stand at the intersection between linguistic and social meaning, and analysis of their phonological and contextual variation gives insight into individual speaker and language change [12].

2. Background

Just is a highly frequent word in spoken English. In the 2014 spoken British National corpus, it is the 27th most frequent word at 0.75 occurrences per 100 words (up from 42nd in the 1994 edition) [13]. *Just* is also increasing over apparent time in Toronto English [19]. These frequency measurements, however, combine multiple functions of *just*.

Other studies show differences in how the various functions are distributed socially and stylistically. Aijmer [1,2] highlights the use of *just* as a metalinguistic marker which occurs between utterances and marks them as expressing attitudes or emotions. Beeching [4] categorizes minimizing, intensifying and filler functions in spoken British English and compares use across ages and sexes. Woolford [22] analyses *just* functions quantitatively in pre-verbal contexts across speaker age and sex in Tyneside English. Across all quantitative studies, *just* is used more by younger speakers, and there is some indication in the BNC that female speakers use it more than males [13].

The word *like* has been analysed with reference to its function and pronunciation in a number of studies. In New Zealand, London and Edinburgh, when *like* is utilized as a quotative marker (e.g. "I was *like*, 'sure you can borrow that'"), it tends to have a more monophthongal vowel and a shorter /l/ to vowel ratio than when it is a verb, conjunction or discourse marker (e.g. "I *like* cheese" / "I feel *like* rubbish" / "You don't, *like*, even know"). Discourse marker and quotative *like* also had a more reduced /k/ [11,18]. Schleef and Turton [18] argue that vowel quality in *like* is linked to its position near intonation boundaries, such that a pre-pausal *like* tends to have a diphthongal vowel, whereas *like* in continuing speech tends to be more monophthongal. Quotative *like* is also more monophthongal compared to other functions, but this is caused by its typical occurrence surrounded by speech. *Like* also varies in pronunciation according to speaker stance and style [10]. More generally, highly frequent words are more likely to be phonetically reduced [6]. As *just* occurs frequently, it can therefore be expected to reduce, for example with vowel and /t/ elision and vowel centralisation. Vowels have a more central F2 when occurring in highly frequent words, and "less frequent words [are] less apt to undergo lenition, since they are more in need of the extra phonetic clarity afforded by distinct, non-lenited articulation" [9, p.103]. Lenition of *just* might also be expected to follow general patterns relating to /t,d/ in coda obstruent clusters. In a recent study of 14,000 tokens in British English, pre-consonantal /t,d/ had an overall deletion rate of 75% [3]. /t,d/ were also more likely to be deleted in frequent words, irrespective of the following phoneme, and *just* specifically had a rate of /t/ deletion over 50% for almost all speakers. Generally, research on /t,d/ deletion has found that there is a spectrum of following contexts from more to less elision: obstruents > liquids > glides > following vowels and pauses [20]. By analysing the variation in *just* across context and pragmatic meaning, the present study aims to understand phonological changes at broader levels than the segment, and to align form with function.

2.1. Predictions

Just is predicted to vary phonetically in several ways: (i) *Just* will be frequent and exhibit high rates of vowel centralization and /t/ elision. (ii) Functions of *just* will differ from one another in vowel quality and segment reduction, similar to *like*. (iii) Pre-pausal *just* will show less phonetic reduction than *just* in continuing speech.

3. Methodology

3.1. Data

The data for this study is taken from the DyViS corpus, task 1 [14]: 100 18-25 year old male speakers of Southern Standard British English recorded in simulated police interviews. Participants were asked a set of questions by a researcher acting in the role of a police officer and answered spontaneously, guided by maps and pictures. Each recording lasts 20-30 minutes. Sound files were listened to, segmented, transcribed and measurements were extracted using Praat (6.2.12) [5]. R Studio [17] and tidyverse [21] was used to process the results, run statistical tests, manipulate, tidy and visualise the data. To interpret the results, various linear mixed effects models were run, utilizing the lme4() package [7]. For categorical data like vowel and /t/ elision this took the form of regression models. For continuous data such as vowel formant readings, ANOVA model comparisons were run initially to identify which variables contributed significantly to predicting the data. Then, the best model was run including only the significant predictors.

3.2. Features and coding

Each token of *just* was extracted for analysis and coded according to a range of variables. *Just* functions were based on [22]. The categories are shown in Table 1, (1)-(6). Examples indicate interviewers 'I' and participants 'P'.

An auditory analysis was undertaken of every token to identify the presence/absence of each of the four canonical segments, and their durations were also measured. The hold phase of the initial affricate /d͡ʒ/ was not included in duration measurements because the onset of the hold was not identifiable if preceded by silence. /d͡ʒ/ was measured from the release of the plosive (indicated by a burst of energy and an aperiodic waveform) to the beginning of open approximation and voicing for the vowel (indicated by clear formant structures, periodicity and a higher amplitude). The end of the vowel was identified where the waveform became aperiodic, reflecting /s/ frication, and the latter boundary for /s/ was defined by either closure for /t/ (indicated by a drop in amplitude and a lack of high-frequency activity in the spectrogram), or the beginning of an immediately following sound (for example, another vowel - "just after"). Where the boundaries between sounds were unclear, they were marked as being unfit for duration or formant measurements and no values were taken. Tokens of KIT, STRUT and the vowel from the filled pause *um* were also extracted from speakers for comparisons of vowel quality. STRUT was chosen as this is the citation form lexical set for *just* and KIT was utilized as others [8] have found that *just* vowels pattern closely with it. *Um* was analysed as a typically more centralized vowel for comparison with the degree of *just* vowel reduction. Following contexts were categorised as either pauses (over 100ms of silence), consonants or vowels.

Category	Sub-category	Definition	Example
Adverb	Particularizer	to do with location, meaning 'precisely/exactly'	(1) I: What do you see from the window? P: There's a tour bus leaves, a city tour bus leaves from **just** down the road.
	Temporal adverb	referring to the recent past or simple perfect	(2) P: he **just** started working there.
Restrictive		meaning 'nothing other than', diminutive	(3) I: Did you give someone a lift after work? P: Um, no it was **just** me driving home.
Discourse	Evaluative	meaning 'no more than' or 'merely / simply one of a few'	(4) I: Do you know someone who works there? P: Not more than **just** having them serve me a drink.
	Intensifier	boosts or maximizes the force of the focused item, meaning 'really'	(5) I: you didn't hang out together. P: I **just** don't know him I'm afraid
Filler		when just is repeated or there is some cut-off and the intended meaning is unclear	(6) P: I tend to park my car **just** be- just behind the hairdresser's.

Table 1: Just *function categories based on [22], aside from filler which is taken from [4].*

	Consonant		Pause		Vowel		
	%	N	%	N	%	N	TOTAL N
Discourse	69.4	347	16.6	83	13.2	66	500
Adverbial	48.3	262	3.5	19	48.2	261	542
Restrictive	86.3	120	2.9	4	10.8	15	139
Filler	27.4	26	35.8	34	31.6	30	95
TOTAL	59.2	755	11.0	140	29.2	372	1276

Table 2: *Distribution of* just *functions according to following context.*

4. Results

The spread of *just* across its functions and following contexts is shown in Table 2. In total, 1,276 tokens of *just* were extracted from the dataset. On average this equates to 0.88 occurrences per 100 words across the corpus. Discourse and adverbial functions of *just* are the most common, followed by restrictive and filler tokens. Tokens which function as fillers are the most likely to occur before a pause. Discourse and restrictive *just*, however, are more likely to occur before a consonant (the most likely place for /t/ elision) than a vowel or pause. Adverbial *just* occurs equally often before consonants and vowels.

1,019 vowel tokens were deemed suitable for formant analysis. The spread of midpoint F1 and F2 measurements are displayed in Figure 1. *Just* vowels generally had F1 and F2 values nearer to KIT and the vowel in *um*, and are distinct from STRUT (a pattern reported elsewhere, e.g. [8]). They are central, with mean F1 at 395 Hz and mean F2 at 1544 Hz.
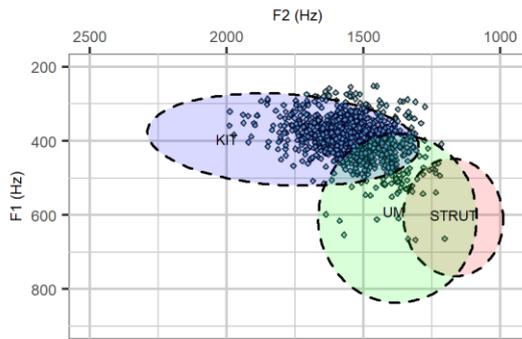

Figure 1: *F1-F2 plot of all* just *vowel midpoints extracted for analysis. Standard deviations of KIT, STRUT and the vowel from* um *shown in ellipses.*

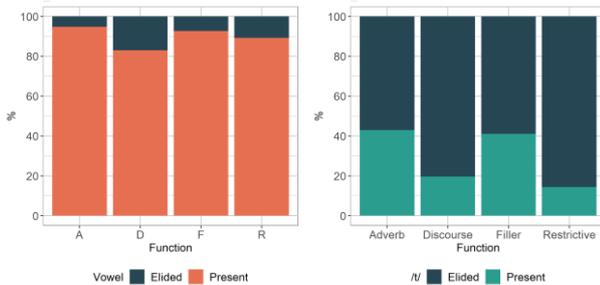## 4.1. Variation by function

Figure 2: Just *functions by proportion of vowel elision (left) and /t/ elision (right). A=adverb, D=discourse, F=filler, R=restrictive.*

. The spread of vowel elision across functions is illustrated in Figure 2 (left panel). Overall, vowel elision occurs in 10.5% of tokens, and /t/ elision in 65.3%. Across functions, discourse *just* had the highest degree of vowel elision (16.8%). This was significantly greater than for adverbial (z(0.23)=5.0, p=<0.001) and restrictive (z(0.3)=-2.0, p=<0.05) tokens. Restrictive *just* had the next highest rate of vowel elision at 10.8%, though this was not significantly higher than adverb or filler tokens.

The proportion of /t/ elision across functions is also shown in Figure 2 (right panel). Tokens of *just* with a restrictive function are most likely to have elided /t/ (85.6%), followed by discourse *just* (80.0%). Table 2 shows that restrictive and

discourse tokens typically occur pre-consonantally, which indicates that /t/ elision is linked to segmental context. This is explored in section 4.2. Again, overall we see discourse *just* showing some phonetic reduction, though this was not significantly different from adverbs or restrictive tokens.
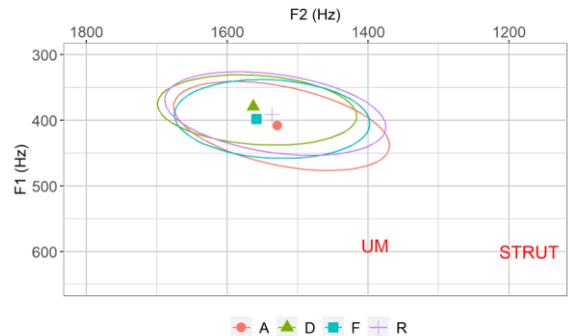

Figure 3 : *F1-F2 plot of all* just *vowel midpoints across functions. Ellipses indicate the standard deviation of values per function. A=adverb, D=discourse, F=filler, R=restrictive.*

F1 and F2 values for *just* are plotted by function in Figure 3. Of the four functions, the one closest to STRUT is adverb. Discourse tokens were furthest removed from the STRUT mean. Adverb tokens had overall higher F1 values (mean 408 Hz) than discourse tokens (mean 379 Hz); this was a significant difference (t(3.4)=-7.6, p=<0.001). For F2, adverbial tokens had slightly lower values (1529 Hz) than discourse tokens (1563 Hz) though function was not a significant predictor in model comparisons for F2 values. Discourse *just* tokens also had significantly lower F1 values than restrictive tokens (t(4.7)=-3.5, p=<0.001). This suggests that discourse *just* has closer vowels than adverbial or restrictive *just*.

In terms of segment duration, there were no clear patterns or significant effects for /d͡ʒ/. For vowels, restrictive and discourse tokens exhibited slightly shorter durations overall (means 52 and 53 ms) than adverb tokens (56 ms) but function did not significantly predict vowel duration (x^2(3)=4.0, p=0.27). Discourse tokens had a longer /s/ (mean 78 ms) and /t/ (mean 65 ms) whereas adverbial tokens had shorter durations (/s/= 68 ms, /t/=54 ms). Both /s/ (t(<0.1)=-4.4, p=<0.001) and /t/ (t(<0.01)=-5.8, p=<0.001) were significantly longer when *just* had a discourse rather than adverbial function. Filler *just* had the longest /s/ (t(<0.1)=-4.3, p=<0.001) and /t/ (t(<0.1)=-4.5, p=<0.001). However, discourse and filler tokens also exhibited large standard deviation for /s/ (discourse: 33 ms, filler: 59 ms) and /t/ durations (discourse: 36 ms, filler: 37 ms).

4.2. Variation by following contexts

Vowel elision rates for *just* across following contexts are displayed in Figure 4 (left panel). *Just* preceding a vowel had the least vowel elision (6.2%), with higher rates when occurring before a consonant or a pause (12.7% and 9.3% respectively). None of these differences between following contexts and vowel elision were significant.

The segments following *just*, however, affected the rate of /t/ elision to a greater degree, as shown in Figure 4 (right panel). /t/ elision had a similar pattern to vowel elision. Pre-vocalic tokens were the least likely to have /t/ elided (22% elision). This was significantly lower than for pre-pausal tokens (z(0.3)=8.5, p=<0.001). Pre-pausal *just*, in turn, had less /t/ elision (72%) than pre-consonantal *just* (92%) and this was also significant (z(0.3)=-5.9, p=<0.001).
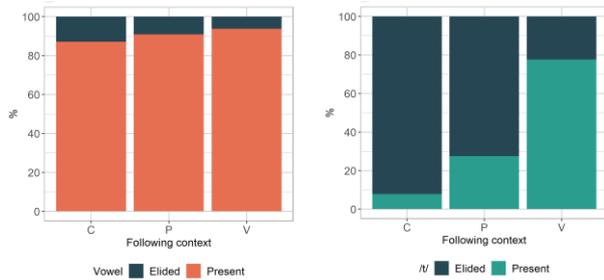
Figure 4: Just *following contexts by proportion of vowel elision (left) and /t/ elision (right). C=consonant, P=pause, V=vowel.*

(t(<0.1)=6.6, p<0.001). For /t/, pre-consonantal tokens had a mean length of 60.2 ms, almost identical to pre-vocalic tokens which had a mean of 59.7 ms, but significantly shorter than pre-consonantal tokens at 105 ms (t(<0.1)=7.5, p<0.001). The pattern is less clear for /d͡ʒ/ and vowel durations with only a few milliseconds between the mean values of each following context

It is clear from Table 2 that some functions occur in certain contexts more than others. Specifically, restrictive and discourse tokens occur more pre-consonantally than adverb tokens do. An interaction of function and following context was therefore included in a /t/ elision regression model with a smaller dataset (one without filler or pre-pausal tokens). This yielded a significant result when comparing discourse with adverb across pre-consonantal and pre-vocalic contexts (z(0.5)=2.15, p =0.031). This suggests that *just* /t/ elision is determined more by the following context than its function. A similar model for vowel elision did not yield any significant interactions.
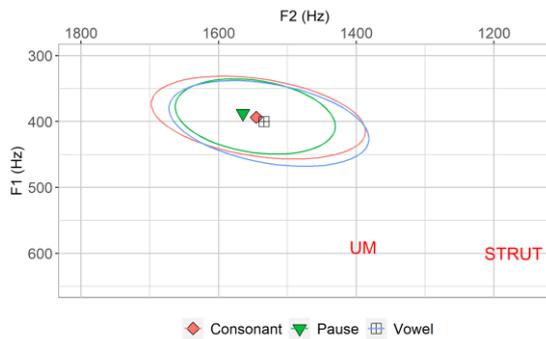
5. Discussion

Overall, *just* is a highly frequent word in the data. At 0.88 tokens per 100 words, it occurs more often than in the 2014 British National Corpus [13] or Tagliamonte's Toronto corpora [19]. This discrepancy may have something to do with the map task participants were asked to undertake – by describing map features, it is possible that there was a higher proportion of particularizer *just* (e.g. "the barber shop is *just* down the road from…").

Though the vowel in *just* is historically STRUT for SSBE, in the present data it is in the direction of KIT but does not fit either category (see Figure 1). This underlines the need to consider word-specific phonetics, as words pattern uniquely and are individual units. The high frequency of *just* is also a potential contributing factor to its vowel production.

Speakers indicate different pragmatic functions of *just* by their choice of segments – aligning phonetic resources with pragmatic meaning. Discourse *just* was more likely to exhibit longer /s/ and /t/, and to have more vowel elision and lower F1 values than other function categories. Restrictive *just* had shorter /s/ and /t/ durations, higher rates of /t/ elision and higher F1 values. Filler *just* exhibited the longest /s/ and /t/ durations. Adverbial *just* exhibited shorter /s/ and /t/ durations, less vowel elision and the highest F1 values. The following context of *just* predicts the rate of /t/ elision with a hierarchy of more to less elision: consonants > pauses > vowels, similar to the pattern found in other studies [20]. Although segment duration and vowel elision and quality are predicted by *just* pragmatic function, following context is a better predictor of /t/ elision. This corroborates findings on *like* [11,18], where there is an interaction between surrounding contexts and token functions.

In terms of phonetic reduction, discourse *just* had higher rates of vowel and /t/ elision and a more central vowel. This is beyond a simple frequency effect as the most frequent 'word' here was actually adverbial *just* (42% of tokens), followed by discourse *just* (39%). Pre-consonantal *just* was the most reduced context, although it patterned closely with pre-pausal *just* in vowel elision and vowel quality. Future work should consider specific following/preceding segments, allowing an exploration into coarticulation effects.

By describing the phonetic variation of *just* with detailed acoustic analyses, it is shown that speakers utilize phonetic resources to indicate social and pragmatic meaning. This is alongside adherence to phonological patterns of contextual variation. Words can display specific phonetic patterns [12, 16], and understanding their variation and meaning sheds light on how we communicate indexical and pragmatic meanings in grammatical as well as lexical words.

Figure 5: *F1-F2 plot of all* just *vowel midpoints across following contexts. Ellipses indicate the standard deviation of values per function.*

Finally, Figure 5 plots formant values across following contexts. Pre-vocalic and pre-consonantal tokens were close in mean vowel quality, with pre-vocalic tokens having a slightly higher F1 (400 Hz versus 393 Hz respectively) and a lower F2 (1534 Hz versus 1545 Hz). The distinct category here is pre-pausal. When *just* occurred before a pause it had a higher F2 (mean 1564 Hz) and a slightly lower F1 (mean 388 Hz) than when it occurred before consonants or vowels. This suggests that pre-pausal *just* tends to have more centralized vowels. However, in model comparisons, following contexts were not significant predictors for F1 (X^2(2)=0.11, *p*=0.94) or F2 (X^2(2)=0.39, *p*=0.82).

For following contexts, the overall pattern of segment duration points towards pre-consonantal just being shorter. With a mean of 166 ms it was far shorter than pre-pause and pre-vocalic (both are mean 224 ms) just tokens. As with function, this was starkest across /s/ and /t/ durations. For /s/, pre-consonantal tokens had a mean length of 66ms, significantly lower than pre-vocalic tokens at 78 ms (t(<0.1)=8.1, p<0.001) and pre-pausal tokens at 97 ms

6. References

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