Processing grammatical differences: Perceiving versus noticing

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Introduction

This chapter explores the relationship between English speakers' processing and awareness of morphosyntactic variability. Much sociolinguistic investigation has focused on speakers' knowledge of what linguistic differences exist and what their social meanings are. This chapter shifts the focus to in-the-moment experiences with language variation, which I investigate experimentally. The experiments test for both the *perceiving* of difference and the *noticing* of that difference, which I argue must be the foundation for more global knowledge of variation and its social meaning.

Theoretical and methodological background

Sociolinguists have long been interested in the relative degree to which the production of sociolinguistic variation is conscious or unconscious, both in speakers' own speech and in that of others. An early categorization was Labov's (1972) sociolinguistic *indicators*, *markers*, and *stereotypes*. Indicators and stereotypes represent ends of a continuum of sociolinguistic awareness: indicators are linguistic features that are correlated with social properties, but they are not deployed for stylistic purposes and speakers are not aware of their social correlation; stereotypes are features subject to highly conscious discussion and social evaluation. Markers are in between, being features that both correlate with social properties and are deployed

stylistically, yet speakers nonetheless may be unaware of their own stylistic uses of them (Johnstone & Kiesling, 2008). Labov's categorization focuses on the relation between sociolinguistic variation, social indexicality, and sociolinguistic awareness.

The levels of awareness articulated by the indicator/marker/stereotype categories are alternatively expressible as levels of *knowledge* held by speakers about the variation in question. I want to suggest that what *awareness* in these categories represents is *implicit v. explicit knowledge* of variation. With stereotypes, speakers *know* that the feature relates to a specific category of speaker; with indicators, speakers *do not know* that the feature relates to a specific category of speaker. Speakers have explicit knowledge of stereotypes that they can articulate and discuss (Silverstein, 1981), but speakers must also have some knowledge of indicators and markers, because they use them as part of their grammatical competence (if they themselves produce them). But knowledge of indicators is *implicit*, not consciously articulable.

As used within most sociolinguistic research (as in, e.g., Silverstein, 1981; Preston, 1996, 2011; Mertz & Yovel, 2003), *awareness* seems to be a matter of the raising of internal *knowledge* to the surface of a speaker's consciousness, with a continuum of *awareness* representing a continuum from knowledge that is nonexistent to implicit to explicit. The construct of knowledge is in overt focus in work by Labov (1973) and Wolfram (1982), both of whom assess the degree to which speakers are aware of—*know*—the patterns and constraints governing dialects other than those they have productive competence in. Awareness-as-knowledge is also foregrounded in the title of Preston's (1996) now-classic piece on sociolinguistic awareness, and his contribution to this volume, which ask "Whaddaya*know*?" (emphasis mine).

In contrast, we can think of a different sort of awareness—one that is centrally connected to subjective language experience, to in-the-moment language processing and production. One of the premises underlying this chapter is that speakers do not spontaneously emerge with awareness of sociolinguistic variation. Rather, explicit knowledge of variation must come about from being exposed to linguistic differences, noticing them, and coming to understand patterns of their use in connection to social facts. While much research has investigated the state of speakers' knowledge about facts of variation (e.g., Johnstone & Kiesling, 2008; Campbell-Kibler, 2009; Staum Casasanto, 2009; Squires, 2013a), the process of speakers coming into that knowledge has gone relatively unexplored, particularly from a processing perspective (one recent exception is Docherty et al., 2013). Knowledge about sociolinguistic variation must come from experience with variability, and explicit knowledge ("awareness") should emerge from aggregated experiences of in-the-moment awareness of linguistic differences—that is, the *noticing* of variation, and coming to understand it as linguistically and socially meaningful.

Differences within and among constructs like *knowledge, awareness,* and *noticing* have been discussed at length in the field of second language acquisition. Schmidt (1990) addresses the role of *consciousness* in second language learning, first determining three ways that scholars have viewed *consciousness*: as awareness, as intention, and as knowledge. Further, three levels of awareness are distinguished: *perception, noticing,* and *understanding*. Things are frequently perceived without being noticed, Schmidt suggests, and are frequently noticed without being understood. Schmidt says,

> When reading, for example, we are normally aware of (notice) the content of what we are reading, rather than the syntactic peculiarities of the writer's style, the style of type in which the text is set, music playing on a radio in the next room, or background noise outside a window. However, we still perceive these competing stimuli and may pay attention to them if we choose. (Schmidt, 1990:132)

Further, Schmidt contends that noticing is requisite to understanding; there is no "subliminal" learning (though there may be subliminal perception).

It is natural to analogize other-dialect awareness to other-language awareness (see Nycz, this volume). If we do so, and take the utility of Schmidt's definitions seriously, then the question "How aware are speakers of sociolinguistic differences?" breaks down into three separate but related questions: How much do speakers perceive of sociolinguistic difference? How much do speakers take notice of sociolinguistic difference? How much do speakers understand of sociolinguistic difference?

I want to think about these concepts as important to disentangle specifically for the burgeoning research field of "sociolinguistic perception," which investigates the relation between variation and perception (see Campbell-Kibler, 2010, this volume). There is a drive within sociolinguistics to more robustly understand the connection between linguistic processing and the social meaning of linguistic forms, for instance in Preston's (2011) detail of how "language regard" might influence comprehension, or in Labov et al.'s (2011) development of a "sociolinguistic monitor" that tracks and stores frequencies of linguistic variables. Sociolinguistic perception research holds the promise of using rigorous experimentation to explore the cognitive structuring of knowledge about variation. It is important to consider the role of awareness in producing that knowledge (as many of the chapters in this volume do, notably those by Beck, Campbell-Kibler, Drager & Kirtley, McGowan, and Preston).

The present study represents an exploration, using temporally sensitive on-line measurements, into what happens *during the processing of language variation*. How do formal differences affect language comprehension? When are linguistic forms noticed as different? Are more-difficult-to-process forms foremost in speakers' awareness of difference? In particular, this

study examines the relation between *perceiving* difference and consciously *noticing* it, positing that these processes are foundational to speakers developing *understanding* and *knowledge* of sociolinguistic variation through exposure to it.

Sociolinguistic processing *in-the-moment* is a relatively unexplored area of research (though see Loudermilk, 2013), and sociolinguistic perception research has in general focused on phonological variation and phonetic variables. The present chapter extends the inquiry into the perception of grammatical variation. How do we measure whether speakers perceive (morpho)syntactic difference, and how do we measure whether they notice it? Psycholinguistic methods are well developed for measuring sentence processing. One such method is self-paced reading, wherein participants move through a sentence unit-by-unit at their own pace. Reading speed is taken to index language processing, with more-difficult linguistic units taking longer to read than less-difficult units. Many times, what is "difficult" is that which is unexpected or probabilistically unlikely (Just et al., 1982). This method has been used to show that speakers are sensitive to agreement mismatches (Pearlmutter et al., 1999; Breadmore et al., 2013), semantic anomalies (De Vicenzi et al., 2003), and probabilistic facts about the occurrence of structural alternatives (Bresnan & Ford, 2010).

Two prior studies have also used self-paced reading to study the processing of regional dialect variants. Kaschak and Glenberg (2004) studied adults' "acquisition" of a novel dialect form: the [*need*+past participle] construction (e.g., *The dishes need washed*) common in the northern Midlands dialect area of the U.S. Participants, who were not users of the structure, read sentences with the *need*+past participle construction more slowly than those with the standard construction (*The dishes need to be washed*). However, this effect was attenuated with multiple

exposures to the pattern, and further research showed that participants were also able to generalize the construction to the verb *want* and to pseudocleft constructions (Kaschak, 2006).

Kaschak and Glenberg's research shows that speakers are sensitive to sentence structures that are not part of their own dialect: participants perceived the "oddity" of the [*need*+past participle] construction. However, participants also became less sensitive to the construction the more they encountered it, and even "learned" its meaning and grammatical patterning. In Schmidt's (1990) terms, they came to *understand* the form. Because Kaschak & Glenberg do not report what their subjects thought about the sentences, we cannot assess whether they *noticed* the construction. Yet if Schmidt (1990) is correct, and understanding requires noticing, then we must assume that participants did notice the differences between sentences. What did participants come to understand [*need*+past participle] *as?* Did they (accurately) categorize it as a dialect form, or did they simply categorize it as an "error" and assume that the experiment involved making errorful sentences? Knowing what the participants *noticed*, and how they metalinguistically categorized what they noticed, might shed further light on the levels of awareness in such "dialect acquisition" studies.

In a more recent study on awareness and reading comprehension, Breadmore et al. (2013) consider self-paced reading times as a measure of "implicit awareness" of subject-verb agreement mismatches. To measure "explicit awareness," they used a post-experiment error correction task of the same subject-verb agreement mismatches. Comparing deaf and hearing children's performance, they show that explicit and implicit awareness are not always aligned. Deaf children did poorly at the error correction task, showing a lack of explicit awareness of agreement errors. But the deaf children's reading times *were* affected by the agreement errors, though this effect did not show up until one word later than for the hearing children.

Though Breadmore et al. (2013) were not studying the *noticing* of differences during the experiment itself, the results nonetheless show that what is perceived does not always rise to consciousness, just as Schmidt (1990) suggests. Similar results have been found in recent brain research suggesting syntactic errors may also be perceived by the brain without conscious noticing of them (Batterink & Neville, 2013). On the other hand, Hanulíková et al. (2012) show that brain responses to grammatical errors can be modulated by sociolinguistic perceptions of the speaker (for instance, that they are a nonnative speaker). But none of these studies explores the perception of sociolinguistic variation of the sort that, for instance, English speakers encounter in across dialects. The links between low-level automatic perception, conscious noticing, sociolinguistic differences, and social information are ripe for further investigation. The present chapter uses both an on-line behavioral measure and an off-line metalinguistic task to explore the link between perception and noticing, providing a basis from which to further explore the role of sociolinguistic processing in sociolinguistic knowledge and its acquisition.

Experiments overview

This chapter presents the results of a series of experiments testing participants' processing of subject-verb agreement variation. The experiments tested adult English speakers' reading times in sentences containing [NP+*don't/doesn't*], where the combination of number on the subject noun and auxiliary verb form is variable. [SG+*don't*] is a common variant of [SG+*doesn't*] across varieties of English ("Feature 171"; often called "invariant *don't*"), and in the US it is associated both descriptively and perceptually with lower social status (see fuller discussions of the social meanings of this form in Squires, 2013a; Squires, forthcoming).

In contrast, [PL+*doesn't*] is not known to be a dialect variant of [PL+*don't*]. It was included in the sentences in order to provide a point of comparison between a non-standard syntactic structure that participants would likely have encountered but probably do not use themselves, versus a structure that participants would likely not have encountered. This provides a way to see whether either perception or noticing are gradiently sensitive to different types of linguistic difference, ones that are already known versus ones that are novel. This method enables probing the role of sociolinguistic experience in the perceiving and noticing of linguistic difference (see also chapters by Beck, Carmichael, Drager & Kirtley, and McGowan).

The experiments presented participants with sentences in three agreement conditions, demonstrated in (1) below: standard, nonstandard, and ungrammatical. "Ungrammatical" is a term of convenience and reflects the fact that I do not know this form to be a systematic part of American English varieties (in Squires, forthcoming, I call this simply the "uncommon" form). Participants saw each critical sentence one time in only one of the conditions.

(1a) Standard (plural):	After eating, the	turtles	don't	walk	very	fast.
(1b) Standard (singular):	After eating, the	turtle	doesn't	walk	very	fast.
(1c) Nonstandard:	After eating, the	turtle	don't	walk	very	fast.
(1d) Ungrammatical:	After eating, the	turtles	doesn't	walk	very	fast.
		1	2	3	4	

In the experiment, participants read sentences one word at a time in a "moving window" paradigm (Just et al., 1982), and after reading each word, they press a button to continue to the next word. Reading times were used to measure the *perceiving* of agreement differences. The dependent measure was always word reading time (from the appearance of a word on screen to the participants' button-press to advance to the next word). Reading time was analyzed at four critical regions within each sentence. These are labeled in the example sentences in (1) as [1] the

subject noun before *don't/doesn't* (noun region); [2] *don't/doesn't* (don't region); [3] the main verb following *don't/doesn't* (verb region); and [4] the word following the main verb (verb+1 region). The noun region is shown in the figures below for purposes of comparison with the other regions, but it is not included in the statistical analyses.

I hypothesized that relative to standard agreement, participants would be slowed the most by ungrammatical agreement and also by nonstandard agreement. Standard agreement should be the most expected in this setting (a university lab) and for this modality (written), and it is also likely the most-used form of agreement for the participants (who are university students). In contrast to standard agreement, nonstandard agreement should be unexpected. Yet because it is a common dialect variant in the US, participants should have had some knowledge of the nonstandard form, in contrast to ungrammatical agreement.

For my analysis, I sought to group participants by whether they consciously *noticed* the agreement differences or not. Schmidt (1990:132) suggests that "noticing can be operationally defined as availability for verbal report, subject to certain conditions." I used a post-experiment questionnaire to ask participants to report if they "noticed anything interesting about the grammar of the sentences." Participant groupings were assigned based on the following criteria: if participants mentioned either *don't*, *doesn't*, subject-verb agreement, or expressions indexing any of these specifically, I considered them to be "aware" participants. If they did not mention any of these features, they were "unaware" participants. Though this method necessarily relies on participants' metalinguistic articulation, my coding criteria for being counted as "aware" attempted to minimize the importance of terminology.

Pilot experiment

Before discussing the experiments conducted for this analysis, I will briefly discuss the results of a pilot experiment whose main goal was not to test for awareness, but rather for the basic processing of syntactic variation. The full discussion of the methods and results of that experiment are reported in Squires (forthcominga). As expected, participants' reading was slowed by both nonstandard and ungrammatical agreement relative to standard agreement, with the largest divergences being for ungrammatical agreement.

In the pilot experiment, most participants (33 out of 43) were classified as aware, showing that these agreement forms were consciously noticed by most participants. One of the goals of the experiments undertaken specifically for this chapter was to investigate whether lesser numbers of non-standard sentences changed this outcome, and so Experiments 1 and 2 contained fewer tokens of nonstandard sentences than the pilot experiment.

In this chapter, I report raw reading times rather than residual reading times (which I report in Squires, forthcoming), because the pilot analysis showed comprehensive differences in reading speed between the aware and unaware participants. Figure 1 shows the mean response times (in milliseconds) across agreement conditions by participant awareness. As shown, aware participants were faster at reading overall than the unaware participants. In a mixed-effects linear regression, awareness was a significant overall predictor of faster reading times (B=-46.371, SE=4.201, t=-11.04, p<.001.) (Observations under 30 ms and over 2000 ms were removed as outliers.)

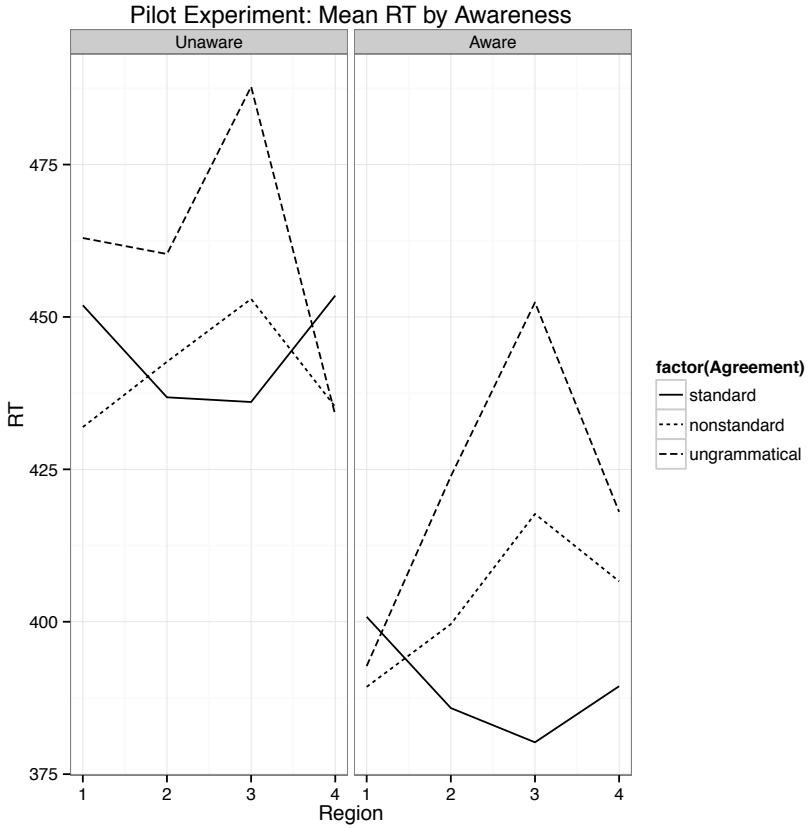

Figure 1. Pilot experiment, reading times in milliseconds by agreement and participant awareness (region 1 = noun, 2 = don't, 3 = verb, 4 = verb+1).

I conducted separate statistical analyses for the two groups, using mixed-effects linear regression with the {lmer4} package in R (Bates, Maechler & Bolker, 2011), estimating p-values with the {languageR} package (Baayen, 2010). I tested for the effect of agreement as a fixed effect. I automatically included experimental block as a fixed effect, since reading times decrease over the course of the experiment, and I included interactions between agreement and block when model comparison showed a significant chi-square value between the two models at the $p<.05$ level. I automatically included random intercepts for experimental items and subjects. I set

standard agreement to be the baseline factor level, and report here the significant differences at p<.05 between the standard and nonstandard and standard and ungrammatical factor levels.

The results of these analyses are summarized in Table 1, which shows the significance of the nonstandard and ungrammatical factor levels' difference from standard within each region. I report in-text the parameter estimates for the fixed effects of agreement only, to preserve space. Note that self-paced reading studies typically identify the strongest effects at the word following the introduction of the grammatical anomaly (Just et al., 1982; Pearlmutter et al., 1999; Kaschak & Glenberg, 2004, 2006; Breadmore et al., 2013). Hence, I consider the verb region to be the primary region of interest for this study.

For the aware participants, agreement was a significant predictor of reading times at all three regions. At *don't*, only ungrammatical agreement caused significantly longer reading times than standard (B=95.406, SE=18.428, t=5.177, p<.001). At the verb, both nonstandard (B=68.860, SE=20.301, t=3.392, p<.001) and ungrammatical (B=163.457, SE=20.274, t=8.062, p<.001) were significantly longer; at the verb+1 region, the effect continued for nonstandard (B=57.177, SE=18.563, t=3.097, p<.01) and ungrammatical (B=54.609, SE=18.416, t=2.965, p<.01) sentences.

For the unaware participants, agreement was significant at the verb region, but only ungrammatical agreement was significantly different from standard (B=163.433, SE=43.898, t=3.723, p<.001). The verb region is the region of strongest effect, as expected, but it is striking that the unaware group shows no significant effect either before or after the verb (as also shown visually in Figure 2).

	don't		verb		verb+1	
Group	nonstandard	ungrammatical	nonstandard	ungrammatical	nonstandard	ungrammatical
Aware		<.001	<.001	<.001	<.01	<.01

Unaware				<.001		

Table 1. Pilot experiment, significance of agreement differences across awareness groups.

The finding that unaware participants were slower readers overall than aware participants is intriguing, given that much work on reading comprehension has shown correlations between poor reading skill and other cognitive and metacognitive processes, including "syntactic awareness" (Wagoner, 1983; Bowey, 1986; Gernsbacher, 1993; Nation & Snowling, 2000; Breadmore et al., 2013). Two unaware participants also reported having a reading disability (though they did no worse on the comprehension questions than other participants), so there may be a relation between reading ability and sensitivity to these differences.

Because unaware participants had longer processing times overall, it seems that longer time processing a linguistic stimulus does not necessarily correlate with heightened awareness of that stimulus (contrary to my intuition). Yet noticing did reflect perception in this experiment, in the sense that the participants who did not report noticing the manipulation seem to have been less strongly affected by it. The unaware participants were affected later, by only the least expected variant (ungrammatical), and their reading recovered faster than the aware participants'. This echoes Breadmore et al.'s (2013) findings, whose explicitly unaware subjects were nonetheless implicitly aware of agreement mismatches—but the effect had a later onset.

Experiments 1 and 2 were designed to follow up on the results of the pilot analysis, by investigating a) if this relationship between perception and noticing (and reading times) could be replicated, and b) whether fewer tokens of non-standard sentences would lessen the overall noticing of the manipulation, to create a more balanced set of unaware versus aware participants.

Experiment 1

As in the pilot experiment, 64 target sentences contained [NP+*don't/doesn't*] while 64 filler sentences did not. In the pilot, however, the total proportion of non-standard sentences throughout the pilot experiment was 25 percent. Experiment 1 lowered the proportion of non-standard sentences, to 19 percent. In each of four blocks in the experiment, participants saw 3 ungrammatical and 3 nonstandard sentences, for 24 total non-standard sentences out of 128 sentences. 8 comprehension questions appeared throughout the session to keep participants engaged in the reading task.

The experiment was conducted using the software program Paradigm. Participants were seated at a computer in a quiet room, and used a response box to advance through the session. Participants were given a self-paced break after the second block of the experiment, and after they completed the four blocks of sentences, they began the questionnaire. In addition to the "awareness" question, the questionnaire asked participants whether they heard a "voice" as they were reading, and to describe it; to describe their own dialect; and to complete a series of demographic questions.

36 participants received undergraduate course credit for their participation. Three participants' data were removed from analysis because they reported not having English as their native or most-fluent language. 18 were coded as aware and 15 were coded as unaware. This presents a slightly more balanced grouping than the pilot analysis, yet the majority of participants still reported noticing agreement differences. Observations above 2000 ms were removed from analysis.

Figure 2 shows that the results for Experiment 1 are similar to those for the pilot experiment. In addition to agreement differences in reading times evident for both groups, aware

participants were faster readers overall (B=-50.075, SE=3.73,t=-13.42, p<.001). The statistical analysis is summarized in Table 2.

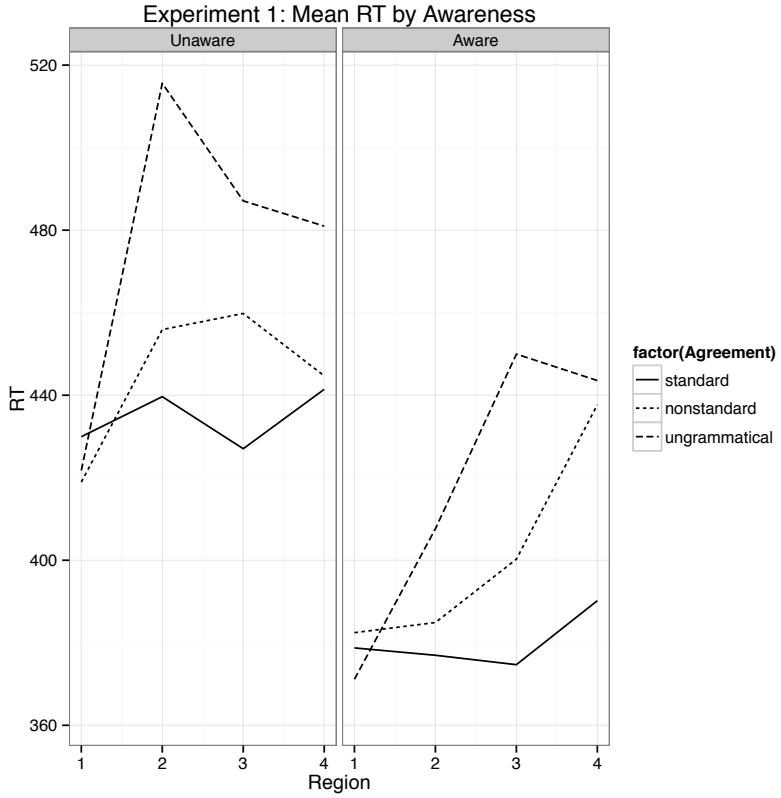

Figure 2. Experiment 1, reading times by agreement and participant awareness.

	don't		verb		verb+1	
	nonstandard	ungrammatical	nonstandard	ungrammatical	nonstandard	ungrammatical
Aware		<.01	<.01	<.001		<.05
Unaware		<.001		<.001		

Table 2. Experiment 1, significance of agreement differences across awareness groups.

Aware participants were again affected at all three regions. At *don't*, ungrammatical sentences took longer than standard sentences (B=87.386, SE=26.779, t=3.263, p<.01). At the verb, both nonstandard (B=79.423, SE=30.002, t=2.647, p<.01) and ungrammatical (B=144.664,

SE=30.002, t=4.822, p<.001) sentences were slower. At verb+1, aware participants read ungrammatical sentences more slowly (B=53.35, SE=25.43, t=2.098, p<.05).

Unaware participants were affected significantly by ungrammatical agreement at *don't* (B=76.883, SE=15.274, t=5.034, p<.001) and by ungrammatical agreement at the verb (B=60.069, SE=17.743, t=3.386, p<.001).

Experiment 1 replicated the pilot experiment results in three ways. First, unaware participants were slower readers than aware participants. Second, for unaware participants, the nonstandard sentences were not significantly slower than standard ones, whereas ungrammatical sentences were. Third, the difference in agreement conditions was not significant at the verb+1 region for unaware participants, but it was for aware participants.

The pilot experiment and Experiment 1 both suggest qualitative differences in the experiencing of the variation during the experiment, between those participants who later reported noticing the manipulation and those who did not. Both experiments demonstrate a difference between what Broadmore et al. (2013) call *implicit* and *explicit awareness*, or what I am calling *perceiving* and *noticing.* Both participant groups perceived the agreement differences, but somewhat differently; and they did not equally notice it.

Importantly, the form expected to cause the greatest disruption was the "ungrammatical" form [PL+*doesn't*], and this was indeed the form causing the greatest slowdown for both groups of participants. That is, both groups perceive the difference between standard and ungrammatical patterns. What about the nonstandard pattern, which did not reach significance as different for the unaware group? It could be that unaware participants do not perceive these because they have greater implicit knowledge of them—they may be speakers of dialects who use the nonstandard form. If this were the case, we might expect some consistency in the demographic makeup of the

unaware participants, reflecting similar dialect backgrounds. However, to the extent that there is social heterogeneity among participants (most of whom were White, and all of whom were university students), this is no more the case for the unaware groups than the aware groups.

Perhaps the most interesting difference between the two groups is that of overall reading times. The finding that unaware participants read overall more slowly than aware participants suggests that sensitivity to variation may be tied to more general language processing or reading comprehension skills, which vary at an individual level. For instance, because this experiment is in the reading mode, it might be the case that unaware participants are poorer readers than the aware participants, indexed by their slower reading times. Reading skills have been linked by researchers to a variety of other cognitive abilities, including comprehension monitoring (Wagoner, 1983) and syntactic awareness (Bowey, 1986; Nation & Snowling, 2000).

One of the factors known to affect comprehension is the ability to suppress information (cues) that is irrelevant or contradictory to the comprehension task (Gernsbacher, 1993). That is, when information is activated that "gets in the way" of comprehension, poor readers are worse at suppressing that information than good readers are, which makes comprehension more difficult. However, if variability in verb forms were considered a type of information that one needed to suppress in order to continue reading the sentence adeptly, we would expect poor readers to be *more* affected by agreement differences than good readers. That is, we would expect the slower readers to show more sensitivity to the agreement differences, and perhaps even more conscious awareness of them, since they would be less able to recover from the mismatches. However, it seems to be that the slower readers were less perceptive of the difference in the first place.

Perhaps unaware participants had a more difficult time processing the sentences in the task, and therefore had less processing energy to commit to formal differences that did not affect

content (see Schmidt, 1990). Or, perhaps they are simply less likely to notice differences in general because of a lower degree of metalinguistic awareness or lower ability to monitor their own comprehension. If either of these were true, performance on the comprehension questions in the experiment should be worse for unaware than for aware participants. In the pilot experiment, unaware participants did average a lower percentage of correct comprehension question responses than aware participants (78% versus 87%), but this amounts only to a one-question difference in average accuracy between groups. In Experiment 1, average accuracy was equivalent between groups (88%). So, generally speaking, failing to register awareness did not align with poor comprehension. All participants seemed to be paying attention to the task and comprehending the sentences, regardless of the degree to which they perceived or noticed the agreement differences.

Experiment 2 was another attempt at replication, and additionally sought to make agreement less salient by reducing further the number of non-standard sentences during the experiment. In their investigation of the (ING) variable, Labov et al. (2011) suggest that the "sociolinguistic monitor" works as a logarithmic function, being extremely sensitive to the first few tokens of a socially marked variant and tapering off afterward. Kaschak & Glenberg (2004) and Kaschak (2006) also found that participants' sensitivity to dialect structures dissipated, representing adjustment or adaptation to the initially-unexpected forms (I also found this in the pilot experiment, as reported in Squires, forthcoming). It is unclear whether speakers' tendency to register conscious awareness of what they perceive, however, is modulated by the number of non-standard tokens to which they are exposed during an experimental session. Experiment 1 used fewer non-standard tokens than the pilot experiment and had a higher proportion of

unaware participants. Experiment 2 drastically reduced the number of non-standard sentences in the experiment to see if this would further mitigate participants' noticing of the manipulation.

Experiment 2

Experiment 2 was identical to Experiment 1 except that only one nonstandard and one ungrammatical sentence occurred in each experimental block, making for 8 total non-standard sentences throughout the experiment (6 percent). Because of the low number of non-standard sentences and the fact that items were not counterbalanced across blocks of the experiment, block is included as a co-varying fixed effect in these regression analyses but it is never included as an interaction effect.

36 participants received extra credit for participating. Three participants' data were removed due to experiment error, and three participants' data were removed because they reported not having English as their native or most-fluent language. Again, and even with the small amount of non-standard tokens in this experiment, a majority of participants reported noticing agreement: 16 were coded as aware and 14 were coded as unaware. Overall observations above 2000 ms were removed as outliers.

As can be seen in Figure 3 and Table 3, the results for this experiment were different from those of the pilot and Experiment 1. Overall, in this experiment, there was no statistically significant difference in reading times between the groups, unlike in the other experiments.

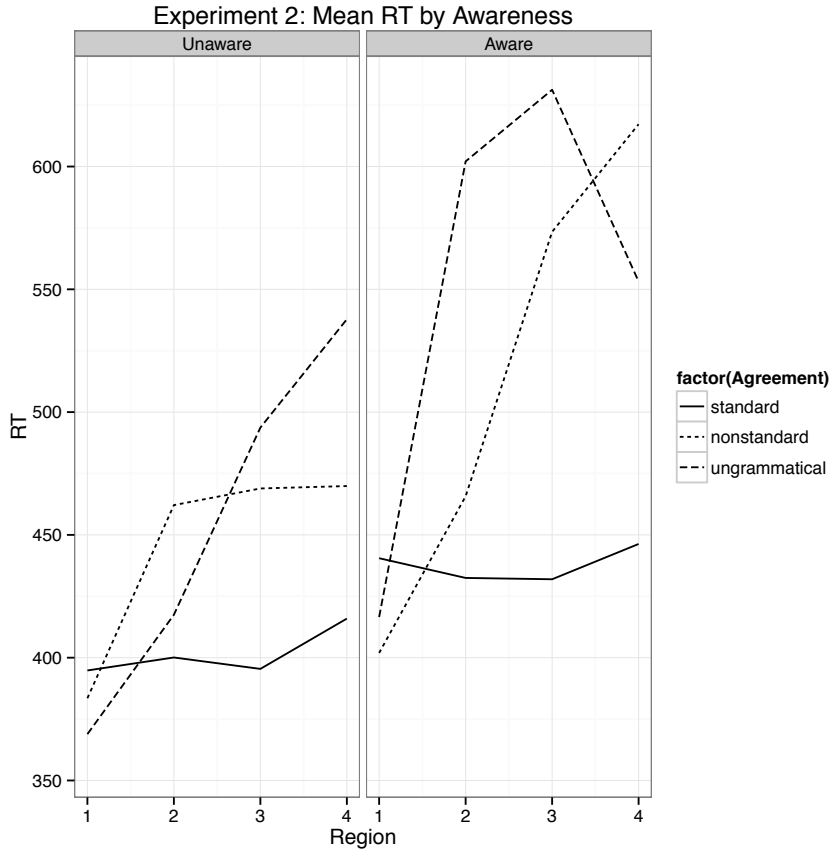

Figure 3. Experiment 2, reading times by agreement and participant awareness.

	don't		verb		verb+1	
	nonstandard	ungrammatical	nonstandard	ungrammatical	nonstandard	ungrammatical
Aware		<.001	<.001	<.001	<.01	
Unaware	<.01	<.01	<.001	<.001		

Table 3. Experiment 2, significance of agreement differences across awareness groups.

For aware participants, agreement was significant at all three regions. At *don't*, the ungrammatical sentences were slower than standard (B=162.625, SE=32.729, t=4.969, p<.001). At the verb, reading was slower for both nonstandard (B=122.512, SE=28.714, t=4.267, p<.001) and ungrammatical sentences (B=183.609, SE=8.714, t=6.394, p<.001). At verb+1, aware participants were still slowed by nonstandard sentences (B=162.90, SE=54.37, t=2.996, p<.01).

For unaware participants, agreement was also significant in all three regions. At *don't,* nonstandard sentences were slower than standard (B=70.545, SE=24.392, t=2.892, p<.01), as were ungrammatical sentences (B=78.38, SE=24.392, t=3.213, p<.01). At the verb, reading was slowed by nonstandard (B=93.215, SE=22.322, t=4.176, p<.001) and ungrammatical (B=117.134, SE=22.711, t=5.158, p<.001). Agreement was not a significant predictor for unaware participants at the verb+1 region.

Experiment 2 did not replicate the difference in reading times between aware and unaware participants. While there may indeed be relations between reading ability, reading skill, or comprehension skill and perception/noticing of morphosyntactic differences, Experiment 2 did not confirm this, and more research is needed on the matter.

Experiment 2 also sought to test whether reducing the number of non-standard sentences in the experiment would reduce the number of participants noticing the agreement differences. This also did not happen: the majority of participants reported noticing the manipulation, just as in the prior experiments. With only 8 non-standard tokens throughout the experiment, most participants nonetheless noticed them, and remembered at the end of the experiment that they had seen them. I discuss this in the section below.

General discussion

These experiments explored the relationship between the perceiving of linguistic variation, as measured by an on-line temporal measure, and the conscious noticing of that variation, as measured by participants' off-line self-reports. The results are consistent enough to support the idea that perceiving and noticing are usefully considered separate cognitive processes, as suggested by second language acquisition researchers such as Schmidt (1990). That

is, while participants could be divided based on their noticing of differences, both groups nonetheless showed perception of the differences. The degree of processing disruption from unexpected agreement—including the timing of its onset, its duration, and its magnitude—differed across groups, though. Aware participants' behavior was more consistent across experiments, whereas unaware participants' behavior was noisier, particularly on either side of the verb region (in the *don't* and verb+1 regions). The results do not permit conclusions about the specific relationship between perceiving and noticing, but they are suggestive at least that perception is prerequisite to noticing.

What are the implications for understanding the role of sociolinguistic awareness in sociolinguistic variation? Sociolinguistic knowledge is the foundation for sociolinguistic perception, in that what we know delimits our perceptual expectations and adjustments (Beck, this volume; Staum Casasanto, 2009). How does knowledge relate to perceiving and noticing? The present study suggests that all kinds of grammatical anomalies are not equally perceived, and that this may be an outgrowth of the structure of participants' linguistic knowledge.

In these experiments, I tested participants' reactions to two different kinds of grammatical "variants": one that they have likely experienced as spoken by real speakers and which is a social stereotype (SG+*don't*), and one that they are unlikely to have experienced as systematically connected to real speakers (PL+*doesn't*). The ungrammatical forms consistently elicited longer reading times than the standard forms across all experiments and awareness groups, whereas the nonstandard forms were more limited in their significance. Further, the ungrammatical sentences always had the longest average reading times at the verb region. The logical explanation for this is that participants have some experience with the "nonstandard" pattern that makes it slightly less unexpected than the "ungrammatical" pattern. Patterns

previously experienced (even if they are not part of one's native dialect) are easier to process than patterns not experienced.

The implication of this is that grammatical forms that one is exposed to, even when they are different from one's own production baseline, are stored in memory—not passed over or discarded (Kaschak & Glenberg, 2004; Kashak, 2006). Of course, at some level, this must logically be the case in order to explain how people make social judgments based on dialect forms that they don't themselves control. The present experiments provide empirical evidence, though, that knowledge of these forms may be active during processing at an implicit level, rather than only activated when a task (or social situation) invokes overt social stereotypes (see Campbell-Kibler, this volume).

As compared to the "nonstandard" pattern, exposing participants to the "ungrammatical" pattern is more akin to traditional sentence processing research which investigates participants' detection of syntactic errors, without considering whether these might be dialect forms or not (see discussion in Squires, 2013b). The difference in reading times between the nonstandard and ungrammatical forms may reflect a distinction between what participants perceived as "variants" and what they perceived as "errors." I think this is a central problem for sociolinguistic perception research moving forward: When linguistic differences are perceived, and even moreso when they are noticed, how are they categorized? Is there a distinction between perception as *variant* and perception as *error*? If so, how do linguistic or social circumstances shift the categorization of incoming tokens? Is one more likely to lead to *noticing* and *understanding* than another? Is one more likely to be kept active in memory than another? These processes must be at the heart of the behavioral responses we see regarding sociolinguistic experience, social evaluations not least among them.

Though the present study did not investigate these questions specifically, the qualitative responses participants gave do speak to them. When participants noticed agreement differences, how did they describe them? What exactly did they notice? In Table 4, I present a list of strings used by "aware" participants across all three experiments. Note that something's number of occurrences does not necessarily line up with number of participants who mentioned it, since some responses included the same word more than one time (especially *don't* and *doesn't*). (Note also that there are 68 total aware participants.)

String	**Tokens**
doesn't	39
don't	37
verb	32
correct	29
agree	25
subject	22
grammar	13
noun	12
grammatical	11
singular	8
wrong	7
plural	7
tense	6
proper	7

Table 4. Strings used by "aware" participants in describing the sentences.

Immediately interesting is the fact that *don't* was mentioned explicitly almost as many times as *doesn't*. These words each appeared in equal numbers of standard and non-standard constructions across the experiments, but because the ungrammatical form caused the greatest degree of processing difficulty, I expected *doesn't* to be noticed more often or more strongly than *don't*. This was not the case, which perhaps speaks to the preexisting salience of the nonstandard *don't* pattern. A few participants also attempted to re-create the "incorrect" sentences in their

responses. Eight of these included a SG+*don't* pattern (only half with a full NP as in the experiment; half used a singular pronoun), while only two of these included a PL+*doesn't* pattern (both with a full NP). Though this analysis can only be qualitative, these responses suggest that participants were applying existing knowledge of SG+*don't* during the memory task of articulating what they had noticed. These forms were more accessible because they were activated by the nonstandard sentences, whereas PL+*doesn't* did not activate existing knowledge.

Though linguistic knowledge may have played a role in what participants noticed, they did not apply ideas about social meaning to their responses. As Table 4 shows, the strings "correct," "grammatical," "wrong," and "proper" occurred in several participants' responses. This is unsurprising given the social stigmatization of the SG+*don't* pattern and the artificiality of the PL+*doesn't* pattern. What is somewhat surprising is that these terms were as close as participants came to articulating social judgments of the sentences. That is, none of their words indicate that they perceived the patterns as being dialect variants rather than as errors (but this may reflect that in the US, dialect variants are ideologized as errors; Preston, 1996). So linguistic knowledge was activated by the stimuli, but social ideas about the forms were not consciously evoked. If participants perceived the nonstandard sentences as socially meaningful, or as sociolinguistic variants rather than errors, this was not evident in their self-reports. It is a non-trivial task for future work to understand the cognitive process that moves from linguistic perception to linguistic noticing to social perception and noticing (and, ultimately, knowledge).

I want to close with a few methodological comments. The experiments presented here have several limitations. First, they used written stimuli rather than spoken stimuli, which is the modality in which nonstandard grammatical forms are more likely to be both experienced and expected. The experiments did find the expected differences between the processing of the

ungrammatical and nonstandard forms, but it would be fruitful to complement this work by investigating the on-line perception of spoken grammatical variation. Second, the self-report method of assessing what was noticed during the experiments results in highly variable information, uncontrolled for factors related to general metalinguistic awareness, verbal ability, reading skill, etc. Yet it seems like a nearly intractable problem: how do we measure what people notice without asking them? Is there a way to access subjective experience with objective measures? If nothing else, I hope to have shown that we shouldn't be satisfied to think that behaviorally sensitive experimental methods like self-paced reading tell the whole story: what speakers do with the information they have perceived differs.

Related is the more general issue of awareness and studies of sociolinguistic perception. Within sociolinguistics, there has been something of a privileging of what is "unaware," visible in the priority of eliciting the most vernacular speech and the most automatic social beliefs. There is also a privileging of "unaware" processing in psycholinguistics, which takes distractor and filler items as an indispensable component of experimental methodology, and seeks the most finely-tuned instruments to measure the most automatic behavioral responses or, even better, non-behavioral (neural) responses. Against this backdrop, what are we to make of the fact that the majority of the participants in my experiments reported noticing the experimental manipulation? If participants noticed what was going on in an experiment meant to test automatic, unconscious perception, is it worrisome?

In his critique of early behaviorist psychology, Brewer (1974: 2) points out that

> the college sophomore does not leave his higher mental processes outside the door when he walks into the experimental room. He not only brings them into the experimental room, but he uses them to try to understand what is going on and what he should do about it.

A subject's metacognitive interpretation of an experiment is unavoidably part of her response to the experiment. College sophomores aside, human beings do not leave "higher mental processes" at the door when they encounter new sociolinguistic information, whether that is in the laboratory or in the wilds of social experience. My findings affirm that perceptual salience involves difference. To probe perception, we must probe the limits of knowledge—and when we are studying knowledge of sociolinguistic structures in particular, probing those limits may inevitably raise awareness. In the wild, too, sociolinguistic information may be processed in just this way: by perceiving difference, taking notice of it, and figuring out where it fits in with what is already known about language and the people who speak it.

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