Sociolinguistic signs as cognitive representations

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INTRODUCTION

*The Sociolinguistic Sign*

As this volume illustrates, the foregrounding of social meaning forms the basis of the “Third Wave” approach to linguistic variation. Speakers exploit the social meaning of linguistic forms, using them as stylistic resources to project personae in interactions. Simultaneously, listeners attribute social meaning to the linguistic styles they observe in the world, encoding relations between the social and linguistic. By focusing on meaning making, the Third Wave approach necessarily treats linguistic variation as a semiotic system (Eckert 2016), with linguistic variants as components of *sociolinguistic signs*.

Linguists most commonly appeal to the dyadic model of the sign put forward by de Saussure (1916), in which a linguistic sign encompasses a signifier (the linguistic form) and a signified (the associated meaning). However, signs are ever-changing, complex structures, with the relationship between form and meaning dependent upon any number of contextual factors. Signs are constantly in flux as they are interpreted and re-interpreted in practice (Eckert 2008a, Silverstein 2003). Following Silverstein (1976, 2003), Eckert (2016), Gal (2016) and others, we can approach sociolinguistic signs according to Peirce’s model of the sign, which incorporates the role interpretation directly into the model of the sign, rather than treating it as a process that acts on pre-existing signs. Peirce’s sign comprises three parts: 1) the *sign-vehicle* (the signifier, sometimes called the *representamen* or *sign*), 2) the *object* (the signified), and 3) the *interpretant* (the interpretation). As defined by Peirce, “a sign[-vehicle] is a thing which serves to convey knowledge of some other thing, which it is said to stand for or represent. This thing is called the *object* of a sign; the idea in the mind that the sign excites … is called an *interpretant* of the sign” (Peirce 1895: 13). When applied to a sociolinguistic variable, the *sign-vehicle* can be defined as a linguistic form or feature that corresponds to some social *object*. That is, a sociolinguistic variant might be defined as a linguistic feature that “serves to convey knowledge of” or “stands in for” some social factor, in Peirce’s terms. In the United States, a fronted and raised TRAP vowel, for example, is a sign-vehicle that may be linkable with the regional origin of the speaker. Variationist work in sociolinguistics has typically framed its work as examining the observable correspondences between linguistic signifiers (sign-vehicles) and social signifieds (objects), illustrating that different ways of saying the same referential thing can in fact point to patterned social differences, along various dimensions.

While the sign-vehicle and object are, of course, crucial components of the sign, equally important is the interpretant, or the “interpretation we develop of some sign[-vehicle]/object relation” (Atkin 2013). For Peirce, the interpretant is indissoluble from the sign-vehicle and object as part of the sign: “the triadic relation is *genuine*, that is, its three members are bound together by it in a way that does not consist of any complexus of dyadic relations” (1903: 273). In other words, it is not the case that our interpretations of signs act on pre-formed links between object and sign-vehicle. This two-way relation is not meaningful — it does not signify — without an interpretant. A correlation between a linguistic form (e.g. backing of the TRAP vowel) and object (e.g. Californian origin) then, doesn’t become socially meaningful until this link is interpreted as such and thereby represented in someone’s mind.

The interpretant is vital to notions of indexicality, which are at the core of social meaning-based approaches to linguistic variation (Ochs 1992, Silverstein 2003, Eckert 2008). Signification cannot occur without meaning being conveyed *to* someone, and no sign exists independently of its construal. This fact allows for, and in fact requires, the sign to evolve over time. Every new instance of signification creates a further sign in a listener’s mind. But we do not convey or take up unperturbed copies of links between linguistic forms and social meanings. The *interpretant* of a sign is always ideologically mediated, informed by a listener’s experiences and expectations, and by myriad attributes of the context in which it is perceived. These subtle shifts in the interpretant are opportunities for change in the social meanings listeners attribute to linguistic forms, and the ways these are linked in their minds. While a group of individuals may reach a consensus about some linguistic form being linked to a particular social meaning, allowing us study those existing links in perception, the particular nature of these links almost certainly varies from individual to individual, from moment to moment, and is always subject to change. The representations we maintain linking linguistic forms and social meanings are thus necessarily dynamic within and among individual listeners.

Peirce defines the interpretant as an essentially cognitive construct — “the Sign creates something in the Mind of the Interpreter… and this creature of the sign is called the Interpretant.” (1909: 493). For theories of sociolinguistic meaning, then, this constitutes both 1) the processes involved in a listener’s interpretation of a form-meaning link, and 2) the cognitive representation that is the result of these processes, which in turn makes possible further instances of social meaning-making. While a majority of work in Third Wave sociolinguistics has focused on how speakers convey social meaning using linguistic resources in production, a smaller share has explored how social meaning operates in listener perceptions and in cognitive representations. In this chapter, I briefly review the growing body of work that has investigated the social meaning of linguistic variation from a perceptual perspective, revealing the *interpretants* listeners deploy in online linguistic processing and social evaluations. I then provide a contribution to this work, exploring how social expectations, coupled with aspects of listener background, can influence how interpretants are encoded in memory, and how they are later deployed in recognition.

Specifically, I use an explicit memory paradigm to test the association between a persona (the Business Professional) and a linguistic feature (the backed TRAP vowel), shown to be linked in linguistic perception (D’Onofrio 2015). Findings show that expectations about a speaker’s social persona bias how we remember — and mis-remember — a feature of that speaker’s linguistic style. In particular, results suggest that not only do we maintain cognitive interpretants, linking social objects and sign-vehicles in the mind, but these representations can bias memory, leading us to attribute utterances to speakers even when they did not occur.

*Studying the Interpretant in Evaluations and Online Perceptions*

Since its inception, variationist sociolinguistic work has shown that language use varies according to broad categories such as speaker age, gender, socioeconomic status, race and ethnicity, sexual orientation, and others. These patterns are borne out not only in production, but also in perception. Work has shown that we as listeners both 1) glean social information from subtle signals in speech (e.g. Lambert et al. 1960, Giles 1970, Campbell-Kibler 2007, Levon 2007), and 2) use top-down social expectations about a speaker when perceiving language (e.g. Strand 1999, Niedzielski 1999, Hay Warren & Drager 2005).

Foundational to the study of perceptions of social meaning is work using the matched-guise paradigm, in which listeners demonstrate that they maintain links between linguistic features and social meanings through evaluations of manipulated speech. In these studies, the presence of a particular *sign-vehicle* in a speech signal is shown to conjure a social meaning in evaluations — even detailed phonetic information can shift listener’s evaluations of a speaker with regard to demographic background, personality attributes, and more (e.g. Campbell-Kibler 2007). Further, the presence of cognitive links between social and acoustic information have been revealed by paradigms that prime social information and examine resulting linguistic processing. For example, Niedzielski (1999) illustrates that when Michigan listeners expect a Canadian speaker, they perceive vowel quality differently than when they expect to hear a Michigander, in ways that reflect their ideological connections between Canadians and particular linguistic forms (in this case, Canadian vowel nucleus raising). Similarly, Hay, Warren and Drager (2005) illustrate that listener awareness of a sound change in progress in New Zealand is reflected in different expectations of the NEAR-SQUARE merger based on a speaker’s perceived age. Such studies have additionally shown that the representations of these links are crucially informed by aspects of the context in which a sign-vehicle is encountered (e.g. Campbell-Kibler 2011) and the listener’s background and experiences (e.g. Sumner & Samuel 2009). All together, these studies provide robust evidence for the interpretant: listeners cognitively construe linguistic features as linked with social meanings, deploying them when processing and evaluating language.

While work in sociolinguistic perception has shown that we must maintain some cognitive representations (interpretants) linking linguistic forms with demographic categories like age and region, recent work has begun to incorporate other types of social information into perceptual work. For example, Third Wave studies in production have suggested that rather than projecting large-scale category membership through the use of linguistic features, individuals use these features to project *personae* in particular interactional moments (e.g. Podesva 2007, Zhang 2008), the accumulation of which builds to broader macro-social patterns of variation. Studies have begun to show that these more highly specified social concepts — *personae* — also figure in linguistic *perceptions*. For example, in a phoneme categorization task, listeners who were told that a speaker was a Valley Girl showed an expectation of TRAP-backing, a feature of that persona’s style, (D’Onofrio 2015), and conversely, hearing a backed TRAP led listeners to rate a speaker as more likely to be a Valley Girl than hearing the same speaker using fronter TRAPs (D’Onofrio 2018). This work suggests that just as speakers use combinations of features in styles to project personae in interaction, listeners maintain cognitive links between persona-based concepts and linguistic features.

To integrate findings in sociolinguistic perception with cognitive models of linguistic representation, much work has incorporated social information into exemplar-based theories of speech perception (see Drager and Kirtley 2016, for an overview). Exemplar models propose that encountered instances of speech are stored in detail, and these episodes or exemplars are cognitively grouped together into clusters, or exemplar clouds, on the basis of perceptual similarity. These clusters form representations of linguistic units (e.g. a word, a phoneme). When a new utterance is encountered, previously experienced exemplars are activated based on how similar they are to the new token, and this stored information is used in the interpretation of the new utterance (Goldinger 1996, 1998, Johnson 1997, 2006, Pierrehumbert 2001). The processes involved in memory — how episodes are first stored or encoded, and how these episodes are activated or recalled in future experiences — serve as a window into how linguistic information is represented cognitively.

Drawing on exemplar models, work in sociolinguistic perception has illustrated that social information must be encoded alongside acoustic information in cognitive representations, explaining how social expectations can activate linked linguistic information in perception (Foulkes & Docherty 2006, Johnson 2006). However, although theories of speech perception and spoken word recognition have frequently deployed experimental tasks that test memory, little work in sociolinguistics has examined memory directly. For example, many current exemplar models propose that listeners do not encode each linguistic episode equally, but instead *weight* certain exemplars more strongly in representations than others, likely due to differences in attention at the time of encoding (Nosofsky 1991, Sumner et al. 2014, Drager & Kirtley 2016). While any number of factors might influence weighting in encoding or bias in recall of a particular sociolinguistic exemplar, the nature of these social factors has yet to be fully examined. One open question in this area is how *a priori* social expectations can influence not only online linguistic processing, as shown in studies mentioned above (e.g. Niedzielski 1999; Strand 1999; Hay, Warren & Drager 2005), but also encoding and later recognition. The study presented in this chapter provides an exploration of how listeners’ social expectations can serve as such a factor influencing recognition memory.

In the study I present below, I examine the link between a social persona — the Business Professional (BP) — and a particular vocalic sign-vehicle — TRAP-backing — in memory. Prior work has illustrated that speakers deploy backed TRAP as part of more careful, professional, or super-standard styles (e.g. Podesva et al. 2012), and that listeners link the BP persona with TRAP-backing in linguistic perception (D’Onofrio 2015). Though not easily connected with a broader demographic category like age, regional origin, or sexual orientation, the Business Professional carries with it ideological ties to formality, middle- to upper-middle-class identity, and supra-local orientation. While the origins of the link between this sign-vehicle and social meaning are not abundantly clear, it perhaps constitutes a semiotic opposition to regional TRAP-*raising*, a feature found in dialects of the Northern Cities, Northeastern, and Southern regions of the U.S. (e.g. Eckert 2000; Labov, Ash & Boberg 2006). TRAP-raising is often discussed and stigmatized meta-linguistically as associable with hyper-local identities in these areas (e.g., Wagner, Mason, Nesbitt, Pevan & Savage 2015). Since the BP embodies an upwardly mobile, upper-middle class persona, it may be the case that TRAP-backing sounds professional by virtue of its distance from raised TRAP. This is supported by the fact that TRAP seems to be backing and lowering in some areas in which TRAP-raising is stigmatized, particularly among speakers who are highly educated and oriented supra-locally (Prichard & Tamminga 2012; Driscoll & Lape 2015).

In the study that follows, I examine the link between backed TRAP and the BP persona in an old-new recognition task, a paradigm commonly used in work on memory. I ask whether an expectation of a speaker’s persona can influence a listener’s memory for particular sign-vehicles linked with that persona. Specifically, I ask whether phonetic forms that are congruent with a persona-based BP prime (backed TRAP) are remembered better than forms that are incongruent with that social prime (fronted TRAP). Findings show that persona-based expectations modulate how well specific utterances are stored and recognized in a way that confirms existing semiotic links between the BP persona and the backed TRAP sign-vehicle. This suggests that our sociolinguistic experiences not only inform our interpretants, or cognitive representations; our existing interpretants also bias the way we remember sociolinguistic experiences.

METHODS

*The Old-New Recognition Task*

In this study, I focus on recognition memory (also called conscious memory, explicit memory, or declarative memory), examining how social information can influence encoding and recognition for words with particular phonetic features. I measure this through the use of an old-new recognition task. This task has been used frequently in work on speech perception in particular, in support of exemplar theories of lexical access (e.g. Goldinger 1996; Nygaard, Burt and Queen 2000; Sumner and Samuel 2005). In this paradigm, listeners are provided with an initial *training* phase, in which they are exposed to critical items. Training is then followed by a *test* phase, in which listeners are presented with another series of items that includes both items previously heard in the training task (old items) as well as items not previously heard (new items). At test, listeners are asked whether or not they heard each item in the training task, classifying each as either “old” or “new.” Performance on the recognition task can then be assessed based on manipulated aspects of the experimental design.

The study presented here adds a top-down social component to the old-new recognition paradigm, examining whether a persona-based prime can influence recognition of words that contain a phonetic feature linked with the persona. Prior to both training and test tasks, half of the listeners received a priori social information about the speaker’s Business Professional persona, while the other half did not. I then examine how the combination of this social expectation and the phonetic form of an auditory stimulus modulates memory. That is, I search for evidence that listeners’ existing *interpretants* affect the ways that exemplars are remembered — an indication of how these exemplars have been encoded into cognitive representations. If an existing link between a social meaning and a phonetic sign-vehicle affects recognition, we would expect *a priori* social expectations to enhance memory for a phonetic feature that matches that social expectation, as compared to cases where the form and meaning are not linked. Here, this means that we expect enhanced recognition in cases that pair the BP persona and backed TRAP vowel.

Two manipulations were built into the design of the old-new recognition task, both between subjects. First, each listener was provided with one of two social information primes. They were either 1) told the speaker they would hear had been described as a Business Professional, or 2) given no speaker information (Baseline). In the initial instructions, they were told that the speaker “would be represented by this picture,” which corresponded to the social prime. For the BP prime, listeners were shown a cartoon picture of a briefcase. For the Baseline prime, in which they were provided with no social information, listeners were shown a green circle (both shown in Figure 1). Again, participants were always informed in writing what the icon was mean to represent (the icon alone was not expected to prime the persona without this training). The icon that appeared with each trial corresponded to the assigned social information condition, and did not vary within-subject — each subject saw the same icon repeatedly with each trial. To the participant, the icon was ostensibly used to cue the beginning of a new trial, disappearing each time a response was entered.

The second manipulation in this experiment was the backness of the TRAP vowel in critical auditory stimuli. Half of the listeners heard critical words that contained backed TRAP vowels, while the other half heard those same words containing fronter TRAP vowels (though not raised and fronted to the degree found in the Northern Cities Shift, for example). Throughout the experiment, a given listener heard *only* backer tokens or *only* fronter tokens, crossed evenly with social prime. The consistency of vowel quality within subjects was used to establish the speaker as either a “TRAP-backer” generally, or as a user of fronter TRAP, rather than allowing listeners to attach backer or fronter quality and its associated social meanings to any particular lexical item. The two manipulations yielded four between-subjects conditions in all (Figure 1).

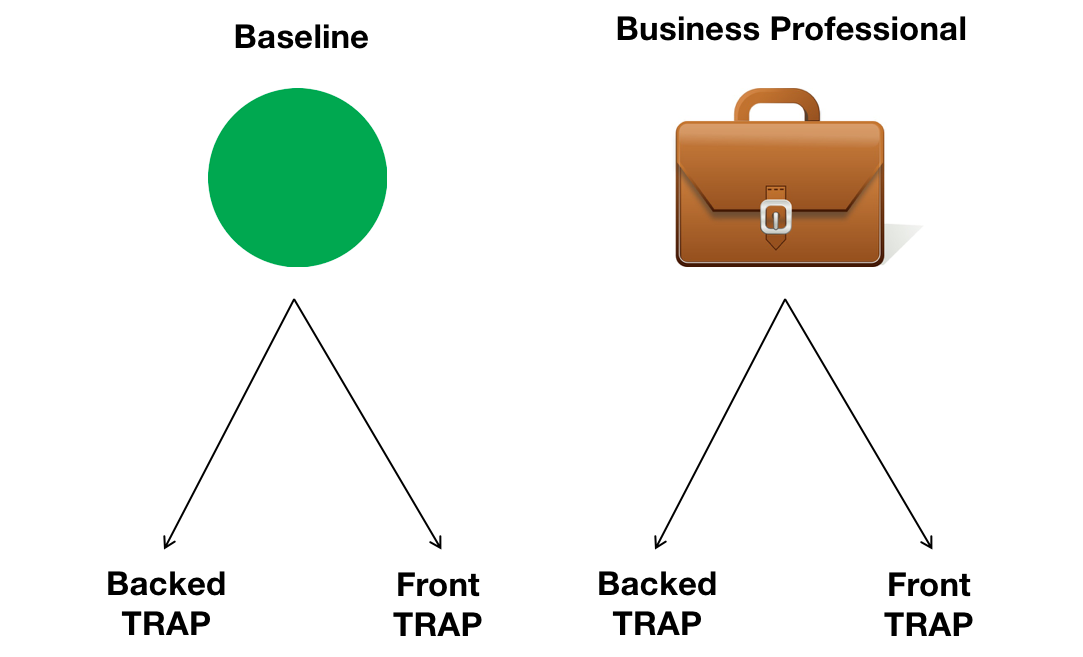


Figure 1. Between-subjects experimental conditions.

Again, if social information enhances memory for a linguistically congruent utterance, we would expect better performance in the condition where backness of TRAP matches the BP prime, as compared to an incongruent condition (fronter TRAP and BP prime) or a condition that does not explicitly activate a priori social information (backed or front TRAP in the Baseline prime conditions). Analysis was conducted to assess both the effect of TRAP backness within the BP prime (e.g. how does memory for backed TRAP compare with front TRAP within the BP conditions?) as well as the effects of backness between the BP and Baseline prime, to ensure that an observed effect within the BP prime was due to the combination of social meaning and linguistic sign-vehicle, rather than a more general effect.

*Auditory Stimuli*

The critical auditory stimuli consisted of backed and front productions of the same 16 TRAP words. None of these words had a minimal pair match with the LOT vowel in American English. This made every word lexically interpretable only as TRAP, regardless of backness of the vowel token. Across both blocks, a given listener heard all of these TRAP words with backed vowels *or* with front vowels. The author, a female native speaker of American English produced these words in citation form. Natural speaker productions were used for all stimuli. While many such tasks use synthesized stimuli, the words used in this experiment contained segmental clusters whose co-articulatory effects were difficult to synthesize believably, and thus the words were produced naturally.

Recording took place in a soundproof booth, using a Turner 2302 microphone and a Rane MS1b preamplifier. Recordings were digitized (44.1 kHz, 24 bits) with an Edirol UA-101, recorded into the software program Audacity version 1.3.12.0. When producing these words, the speaker, a trained phonetician, listened to and emulated backer steps and fronter steps on continua that were digitally resynthesized between her natural TRAP and LOT productions, to approximate TRAP backing (see D’Onofrio 2016 for more information about these continua). Several tokens of each word were produced, and their formants measured. Two tokens (one front, one back) were selected for each word based on clarity of the production, similarity between the two tokens in acoustic features other than vowel quality (e.g. mean pitch, pitch contour, duration), and maximal difference in F2 between the front and back tokens. Across words, tokens were also auditorily considered for perceptual similarity in backness among all 16 of the front tokens and all 16 of the back tokens. F1 and F2 measurements for each critical token are shown in Table 1.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Word** | **Backed Token F1** | **Backed Token F2** | **Front Token F1** | **Front Token F2** | **Front-Back F2 difference** |
| BACK | 1024 | 1711 | 936 | 1913 | 202 |
| CASH | 978 | 1557 | 938 | 1856 | 299 |
| CLASS | 906 | 1560 | 911 | 1821 | 261 |
| CRASH | 910 | 1684 | 923 | 1858 | 174 |
| DAD | 960 | 1706 | 887 | 1889 | 183 |
| FACT | 1000 | 1578 | 928 | 1860 | 282 |
| FAST | 1006 | 1575 | 962 | 1907 | 332 |
| GAP | 960 | 1536 | 877 | 1989 | 452 |
| GLAD | 976 | 1631 | 906 | 1849 | 218 |
| HALF | 1019 | 1707 | 1020 | 1850 | 142 |
| MASK | 949 | 1697 | 1000 | 1884 | 186 |
| SLACK | 906 | 1479 | 945 | 1752 | 273 |
| SNACK | 991 | 1679 | 948 | 1946 | 266 |
| TASK | 970 | 1582 | 966 | 1861 | 279 |
| THAT | 934 | 1670 | 923 | 1903 | 233 |
| TRAP | 982 | 1571 | 936 | 1821 | 250 |
| **Mean** | **967** | **1620** | **938** | **1872** | **252** |
| **Range** | **118** | **232** | **143** | **237** | **310** |

Table 1. F1 and F2 values for stimuli used in memory paradigm.

The speaker also produced a series of fillers, including real words and pseudo-words, recorded in the same manner as the critical stimuli. None of the filler real words or pseudo-words contained a TRAP vowel. All items including critical, filler, and pseudo-word items were monosyllabic with a (C)CVC(C) syllable structure. All tokens were cut and scaled for intensity in Praat (Boersma & Weenink 2011).

*Procedure*

The experiment consisted of two main blocks, separated by a distracter task. Participants were seated in front of a computer screen in a sound-attenuated booth. In initial instructions, listeners were provided with speaker information in writing alongside the assigned visual icon (e.g. *“The speaker you will hear will be represented by this picture: [green circle icon],” or “The speaker you will hear has been described as a Business Professional, and will be represented by this picture: [briefcase icon]”*).

In the initial block, listeners performed a lexical decision task, in which they categorized a series of auditory words as real words (*cash*) or pseudo-words (*jome*). In this task, the visual icon corresponding to that participant’s assigned social prime appeared with each trial, followed by auditory presentation of a word (either real or pseudo word). Upon response to the trial, the icon disappeared. Listeners used a lit button box with buttons labeled “WORD” (left) and “PSEUDO” (right) to respond to each word. They were not presented with any orthographic information about the words. Listeners began with a four-trial practice round to become accustomed to the trial format and button box. They then completed the lexical decision (training) task. The training task included 48 trials in all, 24 real words and 24 pseudo-words. 8 of the real words contained a TRAP vowel (critical words), and the other 16 real words were fillers. Listeners either heard all backed tokens of the 8 critical TRAP words or all front tokens of the 8 critical TRAP words. All listeners heard the same 24 pseudo-words and the same 16 filler real words. After the training block, listeners completed a short distracter task, in which they were asked to solve multiple-choice math problems. They were required to provide an answer for each of the problems, and they were given feedback for each answer to incentivize effort in responses.

Following the distracter task, listeners completed the test block, the old-new recognition task. Listeners had not been told in advance that they would be tested on recognition of items from the lexical decision task. In the recognition task, listeners heard a series of words (all real words) and responded whether they had heard each word in the previous lexical decision block (“old”), or not (“new”). Each trial in the old-new recognition task was visually the same as in the lexical decision task. The visual icon appeared prior to each auditory stimulus. It then disappeared once a response was given, reappearing to cue the next stimulus. For the recognition task, listeners used the keyboard to respond, rather than the button box. Listeners were instructed to place their left index finger on the “N” key, for “new,” and their right index finger on the “O” key, for “old,” to simulate the placement of a button box, but avoiding confusion with the training task. Written instructions between the distracter math task and the recognition task ensured that listeners had located the “N” and “O” keys, as listeners were required to push each key to advance to the next set of instructions. The old-new recognition (test) task also contained 48 trials, consisting of real words only (no pseudo-words). In the test block, all of the 24 real words heard in training were presented, (8 TRAP words and 16 filler words). The remaining 24 test trials were “new,” or real words *not* presented in the training task. 8 were new TRAP words, and 16 were new filler words. Again, for all 16 TRAP words heard in the old-new recognition task, a given listener heard *either* all 16 backed tokens *or* all 16 front tokens, regardless of old versus new status. All listeners heard the same new filler real words. Two experimental lists per condition were devised to counter-balance the old/new status of the TRAP words in the experiment. In both blocks, the order in which the auditory words were presented was randomized for each participant.

*Participants*

60 members of the Stanford University community participated in the experiment. Participants were either compensated with course credit or with $7, and the experiment lasted approximately 20 minutes. Following the experiment, demographic information was collected for each participant via a questionnaire, which collected self-reported age, gender, locations lived and ages at which they lived there and native languages spoken.

Participant locations of origin were coded according to the Atlas of North American English’s dialect regions (Labov et al. 2006). This was coded based on where the participant reported living for at least six months between the ages of 5 and 18. If they lived in multiple regions during this time, this was coded as “multiple.” Given that TRAP patterns differently in the West than in other regions, a binary variable was coded for Western versus non-Western origin. Data from participants who did not self-report as native speakers of American English and those who grew up outside of the United States were removed prior to analysis. Participants were also removed if they showed error rates above two standard deviations from mean accuracy on non-critical items in the old-new recognition task (below 66% overall accuracy). After these eliminations, data was analyzed for a total of 50 participants. Prior to statistical analysis, trials in which a participant did not accurately classify critical words as “real words” in the lexical decision task were removed from the old-new recognition dataset (2% of critical trials). For example, if a given listener inaccurately classified *fact* as a pseudo-word in the lexical decision task, their response to the word *fact* in the old-new recognition task was not considered, as this word was initially not accurately interpreted as the word *fact*.

RESULTS

Analysis of results assessed how the experimental manipulations of the linguistic form(backness of TRAP) and the social meaning prime (BP prime versus no prime) influenced a listener’s ability to accurately classify a word as “old” or “new.” First, I assess the influence of backed versus front TRAP on recognition accuracy *within* the Business Professional prime. I then provide an overall comparison of the BP results to the Baseline results, to ensure that these findings were induced by the combination of TRAP backness and social prime, rather than indicating a general pattern of TRAP backness that would occur regardless of this social expectation.

*Recognition accuracy within the Business Professional prime*

If the BP social prime led to better memory for sign-vehicles that matched that social prime, then we would expect better overall recognition accuracy for backed TRAP words as compared to front TRAP words when listeners are told to expect a BP. To assess this difference, I examine the statistical effect of TRAP backness on overall response accuracy within the BP prime. A generalized linear mixed effects model with a logit-link function was fit on responses within the Business Professional prime conditions, with accuracy of response as the binary dependent variable (correct versus incorrect).

Backness of TRAP (back versus front) was included as a categorical fixed effect. The model also included as a fixed effect of old versus new status of the item (whether the stimulus was previously presented in the “training” phase (old) or not (new)). This factor assesses whether there were differences in accuracy between *hits* — accurately recognizing a previously encountered item as “old” — and *correct rejections* — accurately categorizing an item *not* previously encountered as “new.” I also test the interaction between backness and old versus new status. If backness of TRAP increases accuracy *regardless* of old versus new status of the stimuli, this indicates an overall benefit in recognition from the congruence of the phonetic feature and social prime. However, if backness significantly interacts with old versus new status, this indicates that *hit rate* and *correct rejection* rate (i.e. responses to “old” versus “new” items) behave differently with respect to backness.

Finally, participant factors and their interactions with the other fixed effects were tested. Dialect region (West versus non-West) improved model fit and was included in the final model. Trial order was also tested but was not a significant predictor in all following models and it did not improve model fit nor change fixed effects. It was therefore not retained in the final models. Random intercepts of participant and item, as well as random slopes for item by backness were included. A summary of the fixed effects is included in Table 2.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Predictor | Estimate | Std. Error | Z value | P value |
| (Intercept) | 1.477 | 0.367 | 4.019 | <0.0001\*\*\* |
| Backness = *front* | 0.281 | 0.513 | 0.547 | 0.585 |
| Item status = *old* | 0.364 | 0.401 | 0.909 | 0.363 |
| Western origin = *West* | -0.362 | 0.398 | -0.911 | 0.362 |
| Backness=*front* x Status=*old* | -1.475 | 0.549 | -2.686 | 0.007\*\* |
| Backness=*front* x  Origin = *West* | 0.973 | 0.545 | 1.784 | 0.074 |

Table 2. Summary of fixed effects from generalized linear mixed effect model predicting response accuracy, for Business Professional social prime conditions only. (N=396)

A significant interaction emerged between TRAP-backness and old versus new status, indicating that the effect of TRAP-backness on recognition accuracy is not a general effect, but is dependent on whether listeners are accurately recognizing old items or accurately rejecting new items. This is illustrated in the overall accuracy results for the Business Professional prime, shown in Figure 2. Accuracy for backed stimuli is higher than fronted stimuli in old items (left), but the pattern reverses in new items (right). I thus analyze responses to old versus new items in turn. I begin by assessing listener accuracy in responding to old items, testing how often listeners achieved a *hit* — correct classification of an old item as “old” — as opposed to a *miss* — incorrect classification of an old item as “new.” Accuracy for old items (*hit rate*) reflects how well listeners recognized previously experienced stimuli. Second, I examine listener accuracy in responding to new items, stimuli that were *not* previously heard in training. This tests how often listeners gave a *correct rejection* — correctly classifying new items as “new”— as opposed to a *false alarm* — incorrectly classifying new items as “old.”

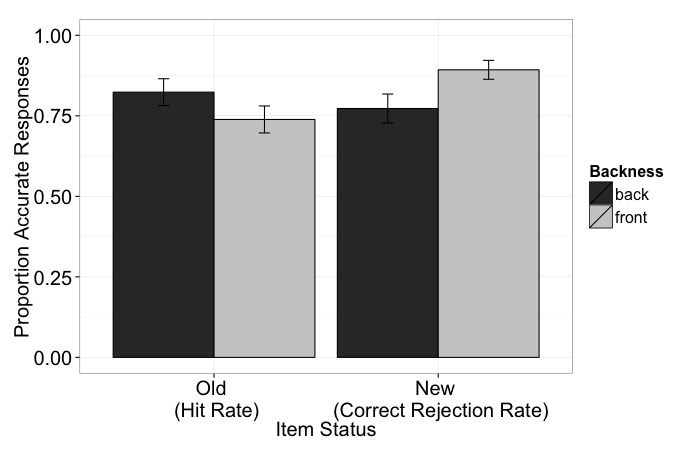


Figure 2. Frequency *accurate* responses in Business Professional prime conditions, by old versus new item status and TRAP backness.

*Hit Rate (Responses to old items)*

If social expectations led to better memory for sign-vehicles that are *congruent* with that expectation, we would expect better accuracy in recognizing old items (higher *hit rate*) with backed TRAP as compared to front TRAP. This expected pattern emerged in results (see left bars in Figure 2) — within the Business Professional prime, listeners who heard backed TRAPs were better at correctly recognizing old words than those with front TRAPs. However, this effect was only marginally significant in a statistical comparison of the back-front contrast within old items (Estimate=0.615, SE= 0.371, Z=1.658, P=0.097), calculated via a least-squares means comparison within the overall regression model. We thus see only suggestive indication that congruence between the BP prime and backed TRAP improved recognition of old items.

Further, Table 1 illustrates a marginally significant interaction between Western dialect region and backness of TRAP. To assess the nature of the interaction between TRAP-backness and a participant’s Western origin, I conducted a *post-hoc* analysis on listener subsets with the BP prime. While this analysis should be approached with caution, as it was not planned and the dataset was not designed to address this question robustly, it provides an exploratory look at the way that listener background can interact with linguistic form and social meaning to influence memory. Within this prime, there were 11 Western listeners and 14 non-Western listeners. In the non-Western group, all listeners were from Northern, Northeastern, or Southern dialect regions, broadly construed.

When hit rates were broken down by Western origin, different effects of backness emerged. Non-Western listeners with the BP prime show the expected effect of backness: Non-Westerners who heard backed TRAP were significantly more accurate at recognizing old items than those who heard front TRAP (Est=1.394; SE=0.673; Z=2.071; P=0.0384). For the Western listeners who received the BP social prime, the effect of backness on hit rate was negligible (Est=0.109; SE=0.589; Z=0.186; P=0.852). The congruence of social information (BP prime) and phonetic form (backed TRAP) *did* enhance memory for old items, for Non-Western listeners in particular. This result provides indication that a congruent combination of social prime and phonetic sign-vehicle can enhance memory, but that this enhancement is contextualized by the listener’s background.

*Correct Rejection Rate (new items)*

I now assess responses to new items within the BP prime. When listeners respond to items that they did *not* hear in the training task (new items), they can either accurately classify a given item as “new” (a correct rejection), or inaccurately classify a given item as “old” (a false alarm). A false alarm indicates that the listener *thinks* they heard the token in the earlier block, when they in fact did not. If sociolinguistic congruence enhances encoding and/or recognition generally, we would expect the combination of the BP prime and backed TRAP to improve recognition accuracy overall, including correctly rejecting new items. However, the results here show the opposite effect: listeners with the BP prime were significantly *less* accurate in responses to new words when they heard backed TRAP, as compared with those who heard front TRAP (see right bars in Figure 2). This difference was statistically significant (Estimate=-0.867, SE=0.407, Z=-2.129, P=0.033). Western origin was tested in a similar fashion as above for new items, but unlike in responses to old items, Western origin did not bear on correct rejection rates for listeners in the Business Professional condition.

The backness pattern is unexpected, given the hypothesis that sociolinguistic congruence would enhance attention at encoding and thus recognition accuracy overall — in that case, we would expect increased accuracy in responses to both old items and new items in the backed TRAP context. However, here, when the social persona (BP) and phonetic sign-vehicle (backed TRAP) were congruent, listeners were more likely to false alarm — incorrectly think that they had previously heard a stimulus.

In fact, this finding, coupled with the “hit rate” effect, corresponds to an overall favoring of “old” responses by listeners in the sociolinguistically congruent condition. Within the BP prime, listeners with backed TRAP were more likely to respond “old”, regardless of *actual* status of an item as “old” or “new.” The congruence of social prime and linguistic information thus does not lead to an overall enhancement in classification *accuracy* of both “old” items as “old” as “new” items as “new,” as found in studies deploying this paradigm that examine the influence of form or voice repetition (e.g. Goldinger 1996; Sumner and Samuel 2005). Instead, the social prime led to a bias toward responding “old,” which amounts to higher accuracy for items that were actually old, and lower accuracy for items that were actually new.

*Assessment of overall response set*

Finally, a model was fit on the entire dataset to assess whether the observed bias toward “old” responses in the backed TRAP condition was unique to the BP prime, or whether this was a general effect of TRAP-backness *regardless* of social expectations. To assess this, I conducted a statistical comparison of the backness effect between the BP and Baseline (no information) primes. Results indicate significant differences between these primes, illustrating that the backness effect in biasing listeners toward “old” responses emerged within the BP prime specifically.

An additional generalized linear mixed effects model with a logit-link function was fit on all responses (N=787), this time with old versus new *response* as the binary dependent variable, rather than accuracy. This assesses the influence of predictors on whether listeners classified a given item as “old” versus “new.” The model included categorical fixed effects of actual old versus new status of the stimulus, backness of TRAP (back versus front), and social prime (BP versus Baseline). A two-way interaction between TRAP backness and social prime was expected if the presence versus absence of the BP prime led to significantly different effects of TRAP-backness. A summary of the fixed effects from this model is shown in Table 3, and the patterns assessed in this model can be observed in Figure 3, which plots the proportion of responses where a listener selected “old” by the three factors modeled in the regression. Note that while participant Western origin was tested in this model, its effects and interactions with other fixed effects were not significant, perhaps due to a lack of statistical power given the complexity of these interactions.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Estimate | Standard Error | Z-value | P-value |
| (Intercept) | 0.147 | 0.0397 | 5.938 | <0.0001\*\*\* |
| Backness = *front* | 0.322 | 0.341 | 0.944 | 0.345 |
| Social prime = *Business Professional* | 0.475 | 0.356 | 1.337 | 0.181 |
| Old versus New = *old* | 3.200 | 0.218 | 14.651 | <0.0001\*\*\* |
| Backness=*front* x  Social prime = *BusProf* | -1.033 | 0.485 | -2.129 | 0.033\* |

Table 3. Fixed effects, generalized linear model predicting “old” responses in entire dataset (N=787)

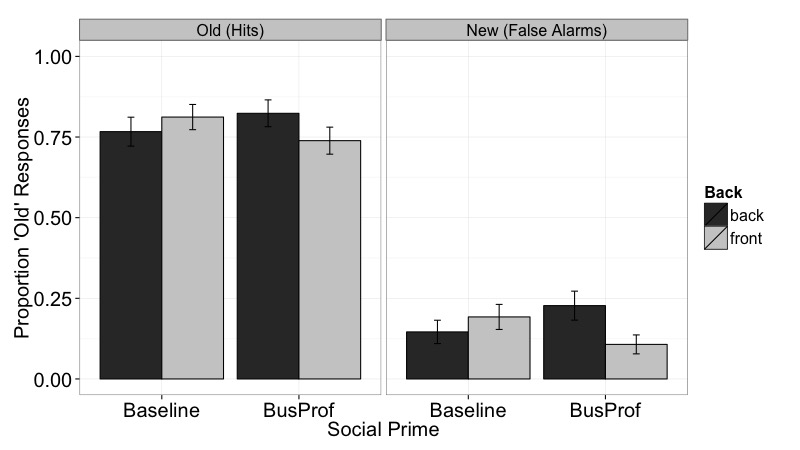


Figure 3. Proportion “Old” responses, by social prime, backness, and old versus new item status.

First, the model illustrates that listeners were significantly more likely to respond “old” when the item was actually old, rather than new. This demonstrates that listeners showed responses significantly better than chance — they were generally quite accurate. This can be observed in the difference between the left and right panes in Figure 3.

Most crucially, the expected two-way interaction between TRAP backness and social prime emerged as significant. The BP conditions shows larger differences between back versus front TRAP than the Baseline conditions do (shown in Figure 3). For both old and new items, backness does not have a strong effect on responses in the Baseline prime conditions. This model illustrates that the influence of TRAP-backing found in the BP conditions is not a general tendency, but is indeed related to the combination of TRAP-backing and the BP social prime.

DISCUSSION

As numerous studies in sociolinguistic perception have shown, characterizing a speaker socially leads listeners to expect particular phonetic forms in that person’s speech (Strand 1999, Niedzielski 1999, Hay et al. 2005, D’Onofrio 2015), drawing upon listeners’ existing interpretants, or representations linking social meanings with phonetic sign-vehicles. The experiment presented here aimed to directly engage with how these links are stored and later recognized, examining the impact of social expectations on explicit memory. Results suggest that expectations related to a speaker’s persona can influence how utterances are recognized. Congruence between the Business Professional persona and backed TRAP affected recognition, confirming the previous finding that listeners link the BP with TRAP-backing perceptually (D’Onofrio 2015). Here, the congruence of social and linguistic information significantly influenced accuracy in responses to new words, and, for a subset of speakers, influenced recognition of old words.

Within the BP prime, listeners were marginally better at identifying old TRAP words when they were backed, but they were significantly *less* accurate at identifying new TRAP words as new when they were backed. False alarms, or instances in which listeners incorrectly classified new words as “old,” were more common in the condition that combined BP and backed TRAP. If we assume that greater attention or activation of sociolinguistically congruent utterances leads to stronger encoding, why would listeners in the congruent condition be *less* accurate in classifying new words? It appears that congruence of the social meaning (BP persona) and sign-vehicle (backed TRAP) biased listeners to *think* that they heard a backed TRAP word previously, regardless of whether or not this was actually the case. This thus made them more likely to provide an “old” response to any stimulus. This suggests that listeners recall linguistic episodes in a way that both relies upon and reinforces their pre-existing sociolinguistic expectations, providing additional evidence that our *interpretants* dynamically shape how we process sociolinguistic variation.

A precedent for the bias observed in these results can be found in social psychological work on confirmation bias (e.g. Darley and Gross 1993, Nickerson 1998). This body of work shows that we pay more attention to experiences that confirm our expectations, while downplaying or ignoring those that contradict them. Though work on confirmation bias has tended to focus on its effects on more explicit processes of reasoning (e.g. expressed beliefs about social groups, political stances, etc.), the higher false alarm rate for congruent feature-meaning combinations here suggests that such a bias can also shape memory for words with particular phonetic features. This tendency aligns with the notion of ideological *erasure* put forth by Irvine and Gal (2000). They define erasure as the process by which “facts that are inconsistent with the ideological scheme either go unnoticed or get explained away” (Irvine & Gal 2000: 38). While experiences, or specific episodes, play a central role in forming the sociolinguistic representations we use in future experiences (Pierrehumbert 2001, Johnson 2006), our existing representations can also influence how we take in and remember new episodes. In particular, our existing *interpretants* can be self-reinforcing in recognition.

Results presented in this study also point to the significance of listener background in conditioning memory. In hit rate, Non-Westerners in particular showed a memory benefit for backed TRAP when they thought the speaker was a BP, while Westerners showed no differences between the two forms of TRAP. While these particular results require more robust confirmation, they raise questions about the influence of ideological differentiation (Gal 2016) in forming and reinforcing the *interpretant* of a given sign. As described in the introduction of this chapter, ideologies of TRAP-backing as professional, formal, or educated may have emerged in opposition to hyper-local or uneducated social meanings of stigmatized TRAP fronting and raising in the Northern, Northeastern, and Southern regions of the United States (e.g. Wagner et al. 2015). The pattern observed in these results suggests that the link between backed TRAP and the BP persona may be salient to non-Westerners in particular, perhaps by virtue of this ideological opposition with TRAP-raising in their home regions. By contrast, in the West, TRAP-backing is a feature of the broader regional dialect (e.g. D’Onofrio et al. 2016), and may not saliently carry links with the BP persona in particular. Note that this pattern of Western origin does not arise in these data across the board — the same listener effect did not emerge in responses to new items. To address the role of listener background and ideologies in shaping cognitive interpretants, a more detailed exploration of listeners’ exposure and attitudes toward sociolinguistic styles and personae is required. Yet the influence of listener background here provides suggestive evidence that the formation and maintenance of the cognitive interpretant is multi-faceted, and that stereotypes derived from ideological sources such as meta-linguistic discourse can shape how new episodes are interpreted.

CONCLUSION

By foregrounding the meaningfulness of sociolinguistic variation, Third Wave sociolinguistics necessarily theorizes the ways in which sociolinguistic signs are conveyed *to* a listener (Campbell-Kibler 2009), as correlations between linguistic features and social factors are not meaningful until they are interpreted. Understanding the *interpretant* as an essential part of the sociolinguistic sign serves two primary purposes in this framework. First, it frames the use of linguistic variation as socially meaningful, rather than as an incidental product of social differences. And second, it offers an explanation for variation in signs between and among individuals, and for the evolution of signs over time. To understand the nature of socially meaningful variation, we must therefore understand how cognitive *interpretants* are structured, formed and updated. A growing body of work, to which this chapter contributes, has illustrated the existence of sociolinguistic signs as cognitive representations (interpretants) within individual listeners (see Drager 2010 for an overview). These representations can shape the way that cognitive processes like linguistic perception, evaluation and, as this chapter, shows, *recognition*, takes place. Results presented here suggest that we choose to incorporate particular episodes and abandon or downplay (that is, erase) others based on our existing *interpretants*. This supports models of linguistic perception that involve attentional weighting of episodes (Nosofky 1991, Sumner et al. 2014), and suggests that social expectations can factor into how this weighting occurs.

Many avenues remain for future investigations into the nature of the *interpretant*. First, future work might more thoroughly examine the nature of social information that is linked with linguistic forms in the mind. While prior work has focused heavily on the influence of macro-social categories on linguistic perception, this chapter illustrates that a social *persona* can also have such an influence, and must therefore exist as part of listeners’ interpretants. Beyond categories and personae, shifting interactional meanings like roles (e.g. Bucholtz & Hall 2005, Ochs 1992), stances (e.g. Du Bois 2007), or perlocutionary effects, and dynamic attributes like affect (e.g. Eckert 2010), have proven crucial in the negotiation of identity using linguistic styles. Second, linguistic forms acquire their social meanings in the context of styles (Eckert 2008, Half Moon Bay Style Collective 2006, Moore and Podesva 2009). Cognitive links between a linguistic form and a social meaning must thus be mediated by representations of collections of features. An important area of future research is the examination of how linguistic and extra-linguistic features of styles work together to cue a social meaning, and are linked to one another in cognitive representations (e.g. Campbell-Kibler 2011, Montgomery & Moore 2017). Finally, the nature of the results presented here suggest that individual listeners’ backgrounds can condition the interpretants maintained by those listeners. Much work remains to examine how experiences and ideologies of particular individuals can shape how interpretants are formed initially and updated dynamically.

REFERENCES

Atkin, Albert. 2013. Peirce's theory of signs. The Stanford Encyclopedia of Philosophy (Summer 2013 Edition), Edward N. Zalta (ed.), URL = http://plato.stanford.edu/archives/sum2013/entries/peirce-semiotics/

Boersma, Paul & David Weenink. 2011. Praat: doing phonetics by computer, version 5.2.17. 1992-2011. http://www.praat.org.

Bucholtz, Mary and Kira Hall. 2005. Identity and interaction: a sociocultural linguistic approach. *Discourse Studies* 7: 585-614.

Campbell-Kibler, Kathryn. 2007. Accent, (ING), and the social logic of listener perceptions. *American Speech* 82: 32–64.

Campbell-Kibler, Kathryn. 2009. The nature of sociolinguistic perception. *Language Variation and Change* 21: 135-136.

Campbell-Kibler, Kathryn. 2011. Intersecting variables and perceived sexual orientation in men. *American Speech* 86(1): 52-68.

Darley, John & Paget Gross 1983. A hypothesis-confirming bias in labeling effects. *Journal of Personality and Social Psychology* 44(1): 20-33.

D’Onofrio, Annette. 2015. Perceiving personae: Effects of social information on perceptions of TRAP-backing. *University of Pennsylvania Working Papers in Linguistics* 21(2): 31-39.

D’Onofrio, Annette. 2016. Social meaning in linguistic perceptions. Ph.D. dissertation, Stanford University.

D’Onofrio, Annette. 2018. Controlled and automatic perceptions of a sociolinguistic marker. *Language Variation and Change* 30(2): 261-285.

D'Onofrio, Annette, Penelope Eckert, Robert J. Podesva, Teresa Pratt & Janneke Van Hofwegen. 2016. The Low Vowels in California. *Publication of the American Dialect Society [Speech in the Western States Vol. 1: The Coastal States]* 101.

Drager, Katie. 2010. Sociophonetic variation in speech perception. *Language and Linguistic Compass* 4(7):473-480.

Drager, Katie & M. Joelle Kirtley. 2016. Awareness, salience, and stereotypes in exemplar-based models of speech production and perception. In Anna Babel (ed.), *Awareness and Control in Sociolinguistic Research* 1-24. Cambridge: Cambridge University Press.

Driscoll, Anna & Emma Lape. 2015. Reversal of the Northern Cities Shift in Syracuse, New York. *University of Pennsylvania Working Papers in Linguistics* 21(2): 41-47.

DuBois, John W. 2007. The stance triangle. In Robert Englebretson (Ed.), *Stancetaking in Discourse: Subjectivity, Evaluation, Interaction*. 139-182. Amsterdam: Benjamins.

Eckert, Penelope. 2000. *Linguistic Variation as Social Practice*. Oxford: Blackwell.

Eckert, Penelope. 2008. Variation and the indexical field. *Journal of Sociolinguistics* 12: 453–76.

Eckert, Penelope. 2010. Affect, sound symbolism, and variation. *University of Pennsylvania Working Papers in Linguistics* 15(2): 70-80.

Eckert, Penelope. 2016. Variation, meaning, and social change. In Nikolas Coupland (Ed.), *Sociolinguistics: Theoretical debates* 68-85. Cambridge: Cambridge University Press.

Foulkes, Paul & Gerard Docherty. 2006. The social life of phonetics and phonology. *Journal of Phonetics* 34: 409-438.

Gal, Susan. 2016. Sociolinguistic differentiation. In Nikolas Coupland (Ed.), *Sociolinguistics: Theoretical debates* 113-135. Cambridge: Cambridge University Press.

Giles, Howard. 1970. Evaluative reactions to accents. *Educational Review* 22:211-27.

Goldinger, Stephen. 1996. Words and voices: episodic traces in spoken word identification and recognition memory. *Journal of Experimental Psychology: Learning, Memory & Cognition*: 22: 1166-1183.

Goldinger, Stephen. 1998. Echoes of echoes? An episodic theory of lexical access. *Psychological Review* 105: 251-279.

The Half Moon Bay Style Collective (Kathryn Campbell-Kibler, Penelope Eckert, Norma Mendoza-Denton, and Emma Moore). 2006. The elements of style. Poster presented at *NWAV 35*, Columbus, Ohio. URL= http://www.ling.ohio-state .edu/~kbck/hmb\_poster.pdf.

Hay, Jennifer, Paul Warren & Katie Drager. 2005. Factors influencing speech perception in the context of a merger-in-progress. *Journal of Phonetics* 34: 458-484.

Irvine, Judith T. and Gal, Susan. 2000. Language ideology and linguistic differentiation.

In P.V. Kroskrity (ed.), *Regimes of language: Ideologies, politics, and identities*. Santa Fe NM: SAR Press pp. 35-83.

Johnson, Keith. 1997. Speech perception without speaker normalization: An exemplar model. In K. Johnson & J.W. Mullennix (Eds.), *Talker Variability in Speech Processing*. San Diego, CA: Academic pp. 145-165.

Johnson, Keith. 2006. Resonance in an exemplar-based lexicon: The emergence of social identity and phonology. *Journal of Phonetics* 34(4): 485-499.

Labov, William, Sharon Ash, and Charles Boberg. 2006. *The Atlas of North American English: Phonetics, Phonology, and Sound Change*. New York: Mouton de Gruyter.

Lambert, Wallace, Richard Hodgson, Robert Gardner, and Samuel Fillenbaum. 1960. Evaluational reactions to spoken language. *Journal of Abnormal and Social Psychology* 60(1): 44-51.

Levon, Erez. 2007. Sexuality in context: Variation and the sociolinguistic perception of identity. *Language in Society* 36: 533–54.

Montgomery, Chris & Emma Moore. 2017. *Language and a Sense of Place: Studies in Language and Region*. Cambridge: Cambridge University Press.

Moore, Emma and Robert J. Podesva. 2009. Style, indexicality, and the social meaning of tag questions. *Language in Society* 38(4): 447–485.

Nickerson, Raymond S. 1998. Confirmation bias: A ubiquitous phenomenon in many guises. *Review of General Psychology* 2(2): 175-220.

Niedzielski, Nancy A. 1999. The effect of social information on the perception of sociolinguistic variables. *Journal of Social Psychology (Special Edition)*, 18(1):62-85.

Nosofsky 1991. Stimulus bias, asymmetric similarity, and classification. *Cognitive Psychology* 23: 94-140.

Nygaard, Lynne C, S. Alexandra Burt & Jennifer S. Queen. 2000. Surface form typicality and asymmetric transfer in episodic memory for spoken words. *Journal of Experimental Psychology: Learning, Memory and Cognition* 26(5): 1228-1244.

Ochs, Elinor. 1992. Indexing gender. In Alessandro Duranti & Charles Goodwin (eds.) *Rethinking context: Language as an interactive phenomenon*. Cambridge: Cambridge University Press, pp. 335-358.

Peirce, Charles S. 1895. Of reasoning in general. Rpt. in Houser, Nathan Andre De Tienne, Jonathan R. Eller, Albert C. Lewis, Cathy L. Clark, and D. Bront Davis, eds. *The Essential Peirce: Selected Philosophical Writings (1893-1913)*. Bloomington: Indiana University Press, 1998. P. 11-26.

Peirce, Charles S. 1903. Sundry Logical Conceptions. Rpt. in Houser, Nathan Andre De Tienne, Jonathan R. Eller, Albert C. Lewis, Cathy L. Clark, and D. Bront Davis, eds. *The Essential Peirce: Selected Philosophical Writings (1893-1913)*. Bloomington: Indiana University Press, 1998. P. 267-288.

Peirce, Charles S. 1909. Excerpts from letters to William James. Rpt. in Houser, Nathan Andre De Tienne, Jonathan R. Eller, Albert C. Lewis, Cathy L. Clark, and D. Bront Davis, eds. *The Essential Peirce: Selected Philosophical Writings (1893-1913)*. Bloomington: Indiana University Press, 1998. P. 492-502.

Pierrehumbert, Janet B. 2001. Exemplar dynamics: word frequency, lenition and contrast. In J. Bybee and P. Hopper (Eds.) *Frequency and the Emergence of Linguistic Structure*. Amsterdam: John Benjamins, pp. 137-157.

Podesva, Robert J. 2007. Phonation type as a stylistic variable: The use of falsetto in constructing a persona. *Journal of Sociolinguistics* 11: 478-504.

Podesva, Robert. J., Lauren Hall-Lew, Jason Brenier, Rebecca Starr & Stacy Lewis 2012. Condoleezza Rice and the sociophonetic construction of identity. In J.M. Hernandez-Campoy & J.A. Cutillas-Espinosa (Eds.), *Style-shifting in Public: New Perspectives on Stylistic Variation*. Amsterdam: John Benjamins, pp. 65-80.

Prichard, Hilary & Meredith Tamminga. 2012. The impact of higher education on Philadelphia vowels. *University of Pennsylvania Working Papers in Linguistics* 18(2): 87-95.

Silverstein, Michael. 1976. Shifters, linguistic categories, and cultural description. In Keith Basso & H.A. Selby (eds.), *Meaning in anthropology*. Albuquerque: University of New Mexico Press, pp. 11-56.

Silverstein, Michael. 2003. Indexical order and the dialectics of sociolinguistic life. *Language & Communication* 23(3): 193-229.

Strand, Elizabeth. 1999. Uncovering the role of gender stereotypes in speech perception. *Journal of Language and Social Psychology* 18: 86–99.

Sumner, Meghan, & Arthur G. Samuel, 2005. Perception and representation of regular variation: The case of final /t/. *Journal of Memory and Language* 52(3): 322–338.

Sumner, Meghan, and Arthur G. Samuel. 2009. The effect of experience on the perception and representation of dialect variants. *Journal of Memory and Language* 60: 487–501.

Sumner, Meghan, Seung-Kyung Kim, Ed King, and Kevin McGowan. 2014. The socially-weighted encoding of spoken words: A dual-route approach to speech perception. *Frontiers in Language Sciences* 4.

Wagner, Suzanne Evans, Alexander Mason, Monica Nesbitt, Erin Pevan & Matt Savage. 2015. Reversal and re-organization of the Northern Cities Shift in Michigan. Paper presented at *NWAV 44,* Toronto.

Zhang, Qing. 2008. Rhotacization and the ‘Beijing Smooth Operator’: The social meaning of a linguistic variable. *Journal of Sociolinguistics* 12(2): 201-222.