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Abstract
Studies have shown that perceived macro-social categories like location of origin, age and class can influence listeners' perceptions of linguistic variables. Other work in sociolinguistics has demonstrated that variables can index multiple social meanings, often associable with personae that are more specific and complex than macro-social categories. This paper brings together these lines of inquiry, testing how *persona*-based social information influences linguistic expectations in a vowel categorization task. The experiment examines multiple social meanings of one sociolinguistic variable: the backing of the TRAP vowel. By virtue of its patterning in California, TRAP-backing has social meanings related to macro-social Californian location of origin, as well as to Californian social types like the Valley Girl. The feature has separately been associated with professional, formal personae. In a vowel categorization task, listeners categorized continua of ambiguous auditory words as either containing a TRAP vowel (e.g., SACK) or a LOT vowel (e.g., SOCK). Prior to the task, listeners were either told that the speaker was from California (macro-social information), the speaker had 'been described as' a Valley Girl, or a Business Professional (persona-based information), or they were not given any speaker information (Baseline). Listeners in both the macro-social and persona-based information conditions were more likely to respond to a given token as TRAP than listeners in the Baseline condition, indicating an expectation of TRAP-backing created by all three social meanings of the feature. The effect was strongest in the Business Professional condition overall, but when the token was particularly backed, the Business Professional effect disappeared, while a strong effect emerged in the Valley Girl condition. These findings demonstrate that persona-based information about a speaker can lead listeners to expect an associated linguistic feature as strongly, if not more strongly, than macro-social information. Crucially, the strength of the effect depends upon the phonetic manifestation of the variable, among other aspects of the speaker voice, listener background, and situational context.

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Perceiving Personae: Effects of Social Information on Perceptions of TRAP-backing

Annette D'Onofrio*

1 Introduction

1.1 Sociolinguistic Perception and Personae

Work on sociolinguistic perception has repeatedly demonstrated that social expectations affect the way that listeners interpret language. For example, in her study of Michiganders' sociolinguistic perceptions, Niedzielski (1999) showed that when listeners were led to believe that a given speaker was from Canada, they categorized tokens of Canadian raising differently than listeners who believed the same speaker was from Michigan. This difference showed that top-down listener beliefs, whether formed via experience or stereotype, crucially inform speech perception. Numerous studies have similarly shown that dimensions of social information aside from speaker region of origin can affect linguistic perception. A speaker's perceived gender (Strand 1999), age (Drager 2011), socioeconomic status (Hay, Warren and Drager 2006), race (Staum-Casasanto 2008) and sexual orientation (Mack and Munson 2012) have all been shown to affect the way particular linguistic variables are heard.

These studies reveal the ways in which the social and linguistic are integrated in real-time perceptions of speech. However, the type of speaker information used in these studies has tended to be of a macro-social, or demographic, quality. While patterns of linguistic variation according to these macro-social categories are well attested, other modes of social characterization have been shown to figure in how language is used by both speakers and listeners.

Recent work has explored the social meanings attached to linguistic variation. Some studies in this vein have shown that speakers use language in enacting particular *personae*, social types that are connected to linguistic styles or registers (Agha 2003). The significance of personae has emerged in meta-linguistic commentary surrounding language (Agha 2003), in intra-speaker and inter-speaker patterns of production (Podesva 2007, Moore 2012) and in social evaluations of language (Campbell-Kibler 2007, Levon 2007), suggesting that personae may be more immediately relevant constructs than macro-social categories in social interaction. That is, rather than taking in people as members of a set of demographic groups, listeners perceive others as holistic social personae, constructs which are themselves connected to broader categories. Thus, large-scale macro-social patterns of variation are built up from the creation, presentation and recognition of personae in interactions.

While the body of work on personae in linguistic interaction is growing, little is known about the relationship between ideological personae and forms of low-level linguistic perception that occur in real-time interactions. This paper brings together work on perception and work on personae as a step toward addressing this gap. To test how persona-based information compares with macro-social information in influencing linguistic perception, I examine a single linguistic feature, TRAP-backing, which has been associated both with macro-social location and with particular personae.

1.2 TRAP-backing and its Social Meanings

The TRAP vowel (often referred to as 'short-a') is a sociolinguistic variable with a variety of social meanings, a few of which I focus on in this study. In particular, I examine the backing of TRAP in the vowel space and the associated meanings that TRAP-backing can take on. In California, the vowel has been found to be undergoing backing over time at a macro-social level, as part of a chain shift in which the front lax vowels are lowering and backing (Kennedy and Grama

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2012). TRAP-backing in California is phonologically conditioned, with the vowel raising and fronting in pre-nasal contexts, and backing elsewhere. As in Canada (Boberg 2011) and elsewhere in the United States (Bigham 2010), TRAP-backing may have been triggered by the low-back merger of LOT and THOUGHT to a higher position in the vowel space, leaving space into which TRAP may move.

Californian TRAP-backing has been documented most robustly in the coastal urban centers of Los Angeles (Hagiwara 1997, Kennedy and Grama 2012) and the San Francisco Bay Area (Eckert 2008). However, recent work on less-urban, inland areas of the state has also found TRAP backing over apparent time among speakers of California's agricultural Central Valley (Geenberg 2014, Podesva et al. in press, D'Onofrio et al. to appear). Thus, while it may have originated in metropolitan areas on the coast, TRAP-backing can be characterized reasonably as a state-wide phenomenon.

Given TRAP-backing's patterning in California, the feature has also come to be associated with personae that ideologically inhabit the state. One prominent Californian persona is that of the Valley Girl, a caricatured female type associated with the wealthy San Fernando Valley in the Los Angeles area. Southern Californian social types like the Valley Girl are typically depicted as blonde, ditzy, materialistic and shallow. Associations between Californian vowel patterns like TRAP-backing and personae like the Valley Girl can be examined through parodic performances of these social types. As early as the 1980s, vocalic features like TRAP-backing were found in performative enactments of these social types (Hinton et al. 1987), such as Frank and Moon Unit Zappa's song, 'Valley Girl.' Stereotypes of this persona and its associated linguistic style, sometimes called Valspeak, persist in the present day. In *Saturday Night Live*'s recurring skit *The Californians*, which aired between 2012 and 2013, actors used TRAP-backing when comedically enacting Valley Girl-esque Southern Californian social types (Pratt and D'Onofrio, under review). However, while TRAP-backing may be present in the speech of many Californians, and in stereotypes of particular Californian personae, very little meta-linguistic commentary surrounds the feature and its meanings in the California context.

Orthogonal to its California-related meanings, TRAP-backing has also been associated with formality and professionalism. Perhaps as a manifestation of a 'superstandard' style (Bucholtz 2001), TRAP-backing has been found to correlate with formal or intellectual contexts and styles. For example, examining the speech of Condoleezza Rice in multiple speech contexts, Podesva et al. (2012) found that Rice used a backer TRAP vowel in the more formal, scripted speech context as compared with the more conversational question and answer period following the speech. TRAP-backing may have taken on this formal or professional meaning by virtue of its association with British English in the American imagination, or it may be a generalized oppositional response to stigmatized TRAP-raising or tensing in some vowel systems of the American Northeast and Northern Cities.

To address how persona-based information can influence linguistic perception, I focus here on the associations between TRAP-backing and two personae: the Valley Girl and the Business Professional. I compare these associations to a macro-social meaning of TRAP-backing: Californian region of origin. Using a perception experiment, I test how these different social meanings affect vowel categorization, examining whether listeners show implicit expectations of TRAP-backing from certain types of speakers.

2 Methods

2.1 Stimuli

The stimuli for the categorization experiment consisted of three nine-step continua resynthesized from three TRAP and LOT minimal pairs: SACK-SOCK, MAP-MOP, and BLACK-BLOCK. These stimuli were constructed similarly to those used in a study of perceptions of TRAP-backing in Canadian English (De Decker 2010), which tested digitally resynthesized 19-step continua from SACK to SOCK. The productions used for the poles of the continua in the present study came from word list productions of these minimal pairs read by a female native speaker of American English in her 20s (the author). Ratings of read speech were elicited in an online survey to provide general impressions of the voice regardless of the use of TRAP-backing. The speaker was heard as

a white female in her late twenties or early thirties, and she was perceived to be from the Northeast, Midwest, or Western United States (including California).

Of the word list productions of the TRAP-LOT minimal pairs, those with clear, monophthongal formant structure were selected. Due to the nature of the acoustic manipulation, the productions needed to be very clearly produced. The word list was therefore produced and recorded in a sound-proof booth in citation style. This style of speech, as compared to a spontaneous conversational style, inevitably conditioned the ways in which these tokens were perceived, which will be addressed further in the discussion section below.

Continua were created for each minimal pair using the *Create Continuum* command in the Akustyk package (Plichta 2013) for Praat. This command creates vowel continua by manipulating aspects of formant structure that relate to perceived vowel quality while controlling for other aspects of the tokens like duration and pitch. For all three word pairs, manipulation created continua from frontest (TRAP production) at Step 1 to backest (LOT production) at Step 9. To control for percepts related to co-articulation, the liquid in BLACK-BLOCK was included in the Akustyk manipulation, and a nine-step fricative continuum was resynthesized by Praat script for SACK-SOCK and spliced into the tokens. All tokens were then scaled for peak intensity.

2.2 Procedure

Each participant was assigned one of four experimental conditions. For listeners in the *Baseline* condition, no social information was provided about the speaker. This condition served as a control against which to compare the other three social information conditions. In the *California* condition, listeners were told, 'The speaker you will hear is from California.' In the *Valley Girl* condition, listeners were told, 'The speaker you will hear has been described as a Valley Girl.' In the *Business Professional* condition, listeners were told, 'The speaker you will hear has been described as a business professional.' For listeners in a non-Baseline condition, the social information was provided twice before the main task, as the aforementioned written sentence. All aspects of the experiment aside from this written information were the same across conditions.

Listeners were first asked to read the relevant condition-based social information, along with task instructions. They then completed a four-trial practice round with unambiguous TRAP and LOT tokens that were not members of any of the three target minimal pairs. The listeners were once again provided with their condition-based social information prior to the main task. In the main task trials, listeners were provided with each auditory step on *one* of the three nine-step TRAP-LOT continua, one at a time. Each step was accompanied by a screen with the word choices (e.g., SACK or SOCK) on the left and right side of the screen, respectively (left-right placement of word was randomized by participant). For each step, participants were instructed to use a [1] (left) or [0] (right) on their keyboards to respond with the word they thought they heard. The presentation order of the steps was randomized by participant. Each participant therefore categorized every step on one of the three continua, eliciting the perceived boundary or crossover point between TRAP and LOT phonemes, or how acceptably backed a TRAP token could be before it began to sound like LOT. Analysis compared this boundary across the social information conditions, controlling for the between-subjects word pair presented. At the conclusion of the experiment, participants completed a demographic questionnaire.

2.3 Participants

30 listeners for each word pair-social information condition combination were recruited, for a total of 360 participants. Participants were recruited and were compensated via Amazon's Mechanical Turk, a website through which workers can perform tasks online. The task was made available only to those 'Turkers' who were from the United States, as specified in their user profiles, and instructions indicated that the task was intended only for native speakers of American English. From an initial screen on Mechanical Turk, participants were led to an external web experiment through which they completed the task. To ensure that sound files were loading properly and that participants were, in fact, listening to the sounds, a test sound was included at the beginning of the experiment in which participants were required to accurately type the auditory word that they heard before they were able to participate.

Following the main categorization task, listeners were asked to complete a questionnaire. This elicited social information about the listener and helped confirm the validity of the responses provided. Listeners self-reported their age, gender, locations lived and the ages at which they lived there, native language(s), perceived self-merger of the words COT and CAUGHT, the listening device they used in the experiment, and whether or not they had any known hearing disorders. De Decker's (2010) vowel categorization task similarly testing TRAP-backing in a dialect of Canadian English found that younger listeners and female listeners were more likely to expect TRAP-backing than their older and male counterparts, mirroring the social patterning of the change in progress in Ontario English. As characteristics of the listener can clearly play a role in vowel classification, the listener information collected in the present study was assessed in analysis for its potential influence.

Participants who did not report English as a native language, did not grow up and live in the United States at the time of the experiment, or reported having a hearing disorder were eliminated from analysis, as were any participants who completed the task more than once (checked by repeats in user identification number, in which case all responses from that listener were removed). Type of listening device was tested as a potential predictor of response, but it was not found to influence results. Those who were missing more than two of the nine categorization responses were also eliminated from analysis, as they were not accurately responding to each stimulus, or experienced technical difficulties in the web experiment. A total of 307 participants remained in the final dataset (25–26 participants per social information condition, per word pair).

3 Results

Analysis was performed using mixed effects regressions in R, via the *lmer* function in the *lme4* package, with *p*-values obtained using the *lmerTest* package. The models estimated binary selection of a LOT word (versus TRAP), with fixed effects of social information condition (default = Baseline), continuum step, and word pair (default = BLACK), with a random intercept of participant. Participant information was also tested, and those factors that improved model fit as measured by AIC were included. First, I tested the effect of social information condition over the entire TRAP-LOT continuum: since continuum step was included as a main effect, statistics for condition effects in the first model reflect *overall* significance of a given social information condition as compared to the Baseline condition. Similarly, this model controlled for between-word differences that emerged among the three pairs that may have arisen due to differences in perception based on phonological environment, formant differences among the three minimal pairs in the word-list productions, as well as any semantically or socially meaningful word-based differences.

In the model testing social information effects over the entire continuum, only the Business Professional condition emerged as significantly different from the Baseline, such that listeners who were told the speaker was a Business Professional were significantly more likely to respond to a given token as TRAP as compared with listeners in the Baseline condition (Table 1).

Predictor	Estimate	Std. Error	T value	P value
(Intercept)	-0.4336	0.02870	-15.109	<0.0001***
Condition = *Business Professional*	-0.05705	0.02198	-2.595	0.0099**
Condition = *California*	-0.03617	0.02298	-1.574	0.1166
Condition = *Valley Girl*	-0.03497	0.02187	-1.599	0.1108
Word = *MAP*	0.1353	0.02110	6.415	<0.0001***
Word = *SACK*	0.3402	0.01831	18.581	<0.0001***
Listener California origin = *non-Californian*	0.05082	0.02154	2.360	0.0189*
Continuum step	0.1249	0.002373	52.624	<0.0001***

Table 1: Overall vowel categorization model summary (N=2736).

These results show that listeners expected Business Professionals to use backed TRAP, and therefore drew the boundary between TRAP and LOT at a backer location than listeners did when they had no advance knowledge about the speaker. Furthermore, listener origin (Californian versus non-Californian) emerged as significant in this model, such that listeners from California (N=48) were more likely to respond to a given token as TRAP than listeners who were not from California (N=259). No significant interactions emerged between California origin and the social information conditions. This effect of listener region is as expected, as Californians are likely to both produce and be exposed to backed TRAP, and thus may generally expect a backer boundary between TRAP and LOT than listeners from regions where TRAP-backing is less common.

While the model testing the full continuum indicated that only the Business Professional condition differed from the Baseline condition, the effects of the social information conditions did not affect the continua uniformly. Figure 1 demonstrates each of the three social information conditions (black lines) as compared with the Baseline condition (baseline in gray, in all three plots). In these charts, a smaller proportion of LOT responses represents a greater proportion of TRAP responses, and thus a greater expectation of TRAP-backing. For each condition, effects were observable only in parts of the continuum, while absent in others.

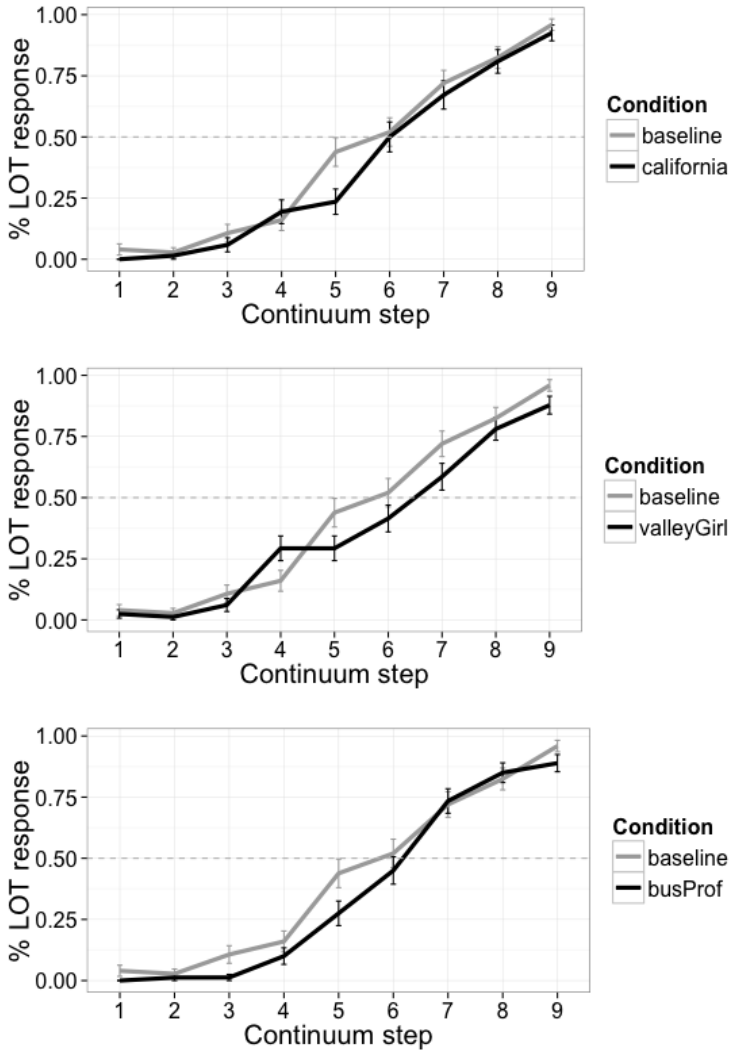

Figure 1: Percent LOT categorization by continuum step (1=front, 9=back), by condition. Baseline condition in gray, versus: a) California condition (top); b) Valley Girl condition (middle); c) Business Professional condition (bottom).

To examine the way that the social information effects arose at different degrees of TRAP backness, I fit models on subsets of the data that respectively tested the fronter and backer halves of the continuum. These two models contained the same fixed and random effects as described above for the overall model, the first testing the fronter portion of the continuum (Steps 1–5, shown in Table 2), the second testing the backer portion of the continuum (Steps 5–9, shown in Table 3). Given the odd number of steps in the continuum, the middle step was included in both data sets.

Predictor	Estimate	Std. Error	T value	P value
(Intercept)	-0.2153	0.03231	-6.664	< 0.0001 ***
Condition = *Business Professional*	-0.07550	0.02421	-3.118	0.00199**
Condition = *California*	-0.04476	0.02531	-1.769	0.07796
Condition = *Valley Girl*	-0.006904	0.02409	-0.287	0.77465
Word = *MAP*	0.03349	0.02324	1.441	0.15049
Word = *SACK*	0.2176	0.02017	10.786	< 0.0001 ***
Listener California origin = *non-Californian*	0.03930	0.020373	1.656	0.09867
Continuum step	0.07579	0.004899	15.471	<0.0001***

Table 2: Vowel categorization model summary for front half of continuum, Steps 1–5 (N=1521).

Predictor	Estimate	Std. Error	T value	P value
(Intercept)	-0.73598	0.05797	-12.695	< 0.0001 ***
Condition = *Business Professional*	-0.06098	0.03287	-1.855	0.0645
Condition = *California*	-0.05646	0.03436	-1.643	0.1014
Condition = *Valley Girl*	-0.07808	0.03270	-2.388	0.0176*
Word = *MAP*	0.23747	0.03153	7.532	< 0.0001 ***
Word = *SACK*	0.51431	0.02738	18.788	< 0.0001 ***
Listener California origin = *non-Californian*	0.06455	0.03220	2.005	0.0459*
Continuum step	0.15463	0.00612	25.268	<0.0001***

Table 3: Vowel categorization model summary for back half of continuum, Steps 5–9 (N=1518).

Examining subsets of the continuum, all three social information conditions showed some effect in the expected direction: listeners in the California, Valley Girl, and Business Professional conditions provided more TRAP responses than those in the Baseline condition at *some* point in the continuum. While all three target conditions showed this pattern, the degree of significance and location in the continuum at which the effect emerged differed across the conditions.

First, a trend emerged in the comparison of the California condition (black line in Figure 1a, top) and the Baseline (in gray), such that listeners in the California condition were more likely to hear a given token as TRAP than listeners in the Baseline condition were. However, this effect was not significant in the regression models. As Figure 1a illustrates, an observable difference arose at a single ambiguous middle step (Step 5), with essentially no differences at any other points. A post-hoc *t*-test demonstrated that for responses to Step 5, there was indeed a significant difference between the California (M=0.235) and Baseline (M=0.438) means (t=2.5989, p=0.01037). For listeners who were told that the speaker was from California as compared to listeners who had no speaker information, the boundary difference between TRAP and LOT became relevant right at the middle or crossover point, while no difference emerged in the fronter and backer steps of the continuum.

A significant difference emerged between the Valley Girl condition (black line in Figure 1b, middle) and the Baseline condition (in gray), in the expected direction, but only in the backer half of the continuum (Table 3). No significant difference arose across the fronter half of the continuum (Table 2), and in fact, a reversal of the expected pattern occurred in a fronter step (Step 4). These results indicate that listeners were more likely to expect very backed TRAP vowels from a Valley Girl than from a speaker about whom they had no information, and further, some listeners expected an exaggerated, hyper-backed TRAP token from a speaker that was described as a Valley Girl.

Finally, the Business Professional condition emerged as the strongest social information effect in comparison with the Baseline (black line in figure 1C, bottom). However, this very strong effect was confined to the fronter portion of the continuum (Table 2), while only marginal in the backer portion of the continuum (Table 3), a complementary effect to the Valley Girl condition.

4 Discussion

These vowel categorization results show that top-down social information affects categorization of TRAP versus LOT minimal pairs, both in the macro-social condition (California) and in the persona-based conditions (Valley Girl, Business Professional). As others have demonstrated, when social expectations are created for a listener, linguistic perceptions can shift. Furthermore, stronger effects arose when the speaker was characterized as a Business Professional or Valley Girl as compared to a Californian, illustrating that a listener's expectations of a speaker's *persona* can have a greater influence on their low-level linguistic perceptions than expectations about that speaker's macro-social category membership. This finding supports the contention that in interactions, variables can be used to index specific social types, which may then build up to form the recognizable correlations between linguistic variation and broad demographic categories.

In this task, the strongest effect arose in the Business Professional condition, indicating that in this context, a backed TRAP may cue a professional social meaning more strongly than other, California-related meanings. This was particularly true in the fronter part of the continuum, where a majority of listeners agreed that the token should be categorized as TRAP across all conditions, but even more listeners heard TRAP when they thought the speaker was a Business Professional than those who had no information. The relative strength of the professional meaning here could be influenced by a number of factors, including the careful citation style in which the stimuli were produced, expectations of formality induced by an experimental context, or other features of the voice itself. In spite of this effect in this particular task, it should not be concluded that the Business Professional meaning of TRAP-backing is somehow stronger or more salient than TRAP-backing's California-related meanings in any generalizable way. The most relevant social meanings evoked by a token of a linguistic variable are necessarily influenced by aspects of the speaker, listener, and interactional context, and can shift from speaker to speaker, from interactional moment to interactional moment (e.g., Campbell-Kibler 2007). However, examining these varied effects within a single paradigm confirms that in a given utterance, some social meanings of a linguistic variable are more strongly activated than others, and crucially, these meanings can be persona-based.

A clear effect of listener background was also demonstrated in this study. Whether or not listeners were born and raised in California had an impact on how tokens were heard. Across the entire continuum (Table 1), the Californian listeners were more likely to expect TRAP-backing than their non-Californian counterparts, regardless of the social information condition that they were placed in. This result reflects the patterning of TRAP-backing found in larger-scale production studies: Californian listeners are more likely to have been exposed to TRAP-backing and are more likely to produce TRAP-backing themselves, thus their boundary between the two phonemes may be relatively backer than listeners from other parts of the United States. Though interactions between listener origin and social information conditions were not significant, a study targeting a more robust and balanced sample of Californians versus non-Californians would help elucidate the ways that linguistic perception is influenced by the interaction of listener characteristics and social expectations, both of which are inevitably intertwined.

Finally, the different social meanings of TRAP-backing in this study governed *where* in the continuum an effect of top-down social information appeared. While the Business Professional

condition showed the strongest effect overall, the significant difference from Baseline emerged solely in the front half of the continuum (Table 2), with no effect in the backer steps. The Valley Girl condition, by contrast, was inconsistent throughout the front and middle parts of the continuum, but showed the expected difference from Baseline in the backest tokens (Table 3). In one ambiguous middle step (step 5), all three conditions showed a significant difference from the Baseline, indicating that all three social meanings of TRAP-backing can affect linguistic perception. However, the large disparities in other areas of the continuum illustrate that different phonetic manifestations of TRAP-backing prompt different social expectations. For example, the effect of the Valley Girl persona at the backest part of the continuum likely reflects the way that TRAP-backing is portrayed in stereotypical performances of these social types. In stylized or parodic performances, indexical cues tend to be exaggerated, drawing attention to the links between these cues (like linguistic features) and the social meanings being portrayed (Coupland 2001). Specifically pertaining to this task, exaggeration of vowel productions has been found in performances of Southern Californian social types, in which TRAP-backing is used (Pratt and D'Onofrio, under review). The Business Professional meanings appear to be connected to less extreme realizations of TRAP-backing, likely those more akin to the variance found in intra-speaker production patterns (e.g., Podesva et al. 2012). The phonetic manifestation of linguistic variants, like other aspects of the interactional context, serves to narrow the social meanings that may be foregrounded in a particular utterance.

5 Conclusion

This paper merges work on personae in stylistic variation with work on sociolinguistic perception, demonstrating that persona-based social meanings can be as influential as macro-social meanings in shifting listeners' expectations of language. Adding to the body of work that advocates for the significance of personae in linguistic interactions, these findings show that not only do speakers project particular personae with their speech, listeners use persona-based expectations to process linguistic variation. This suggests that studies of sociolinguistic perception, which have largely focused on macro-social patterns of language, expand to investigations of the other types of social meanings at play in the formation and application of linguistic expectations. Crucially, in this study, the social effects that arise depend upon aspects of the listener (here, location of origin), manifestation of the linguistic feature itself (degree of backness), and aspects of the context in which the utterance is couched (production style and experimental setting). This provides further evidence that the social meaning indexed by a particular linguistic variant is fluid, not fixed, even in the processes involved in implicit linguistic perception.

While this study illustrates the effect of persona-based information in vowel categorization, additional work remains to investigate the ways that personae figure in other modes of linguistic perception, and for other types of linguistic variables. For example, D'Onofrio (2015) uses an eye-tracking paradigm to examine the way that persona-based expectations arise at an even more automatic level of perception. Furthermore, the present study examines a feature (TRAP-backing) that has gone largely unacknowledged in public discourse. Future studies may fruitfully investigate the ways in which personae figure in perceptions of variables that differ with respect to listeners' meta-linguistic awareness, exploring the interaction between consciously recognized stereotypes and expectations and lower-level sociolinguistic perceptions.

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