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Social Threat as Motivation for Phonetic Divergence: Evidence From Nonbinary Participants

Jack Rechsteiner

University of Pittsburgh, Pittsburgh, Pennsylvania, USA

Correspondence: Jack Rechsteiner (JJR156@pitt.edu)

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ABSTRACT

This paper investigates whether nonbinary speakers' imitation of extended voice onset time (VOT) in word-initial English /p, t, k/ is impacted by whether they believe they are listening to a nonbinary or binary model speaker. Forty-five nonbinary American English speakers participated in an online VOT shadowing task, and the results find that nonbinary speakers diverge to a significantly greater degree away from a binary-identified speaker than a nonbinary-identified speaker or a speaker whose gender is not identified. Social information can impact the degree to which one speaker phonetically converges with another speaker, and nonbinary speakers have been shown to alter their speech due to their social environment, specifically when there is a threat of being misgendered. These patterns suggest that spaces that are not identified as nonbinary-inclusive present a social threat for nonbinary speakers, thus motivating them to shift their linguistic productions depending on social context.

1 | Introduction

Gender has been seen as a predictor of sociolinguistic variation, alongside other macro-social categories, because gender is considered a salient component in social hierarchies, power relations, and public discourse (Eckert and McConnell-Ginet 1992; Labov 1990). However, much previous sociolinguistic work has considered gender in terms of the male–female binary, which has been critiqued for being overly simplistic and theoretically inadequate for explaining the interplay between gender and linguistic variation (Becker et al. 2022; Rechsteiner and Sneller 2023). The task of queering the field of sociolinguistics requires challenging normative discourses of gender and sexuality and expanding the frameworks through which gender and sexuality are often viewed (Calder 2023). Nonbinary individuals show the limitations of the traditional gender binary, as nonbinary identities can be somewhere between male and female, a fixed gender other than male or female, a fluid gender, or an identity with no gender at all (Richards et al. 2017). Being nonbinary is not equivalent to being gender neutral or ambiguous, and nonbinary people cover a wide range of possible gender expressions. This multiplicity and fluidity means that it is not enough to move our analyses of gender from a binary to a ternary by merely adding a third gender category. Instead, nonbinary identities destabilize rigidly bounded gender categories in a way that enables examinations of how gender works more broadly and, as discussed in this paper, how identity interacts with power. A unifying aspect of nonbinary identities is that they challenge hegemonic beliefs about gender, and this opposition commonly causes nonbinary people to be marginalized by dominant social systems of power (Cordoba 2023). Research focusing on nonbinary linguistic variation allows for questions that could not be explored with previous theories of gender, as nonbinary individuals often employ linguistic resources and engage with social interlocutors in ways that differ from binarily gendered speakers (e.g., Calder and Steele 2025; Steele 2022). Additionally, this research can help understand the experiences of individuals with marginalized identities and how these identities are reflected in their linguistic practices.

This article examines the effect that shared identity has on the linguistic production of speakers with marginalized nonbinary identities. For queer individuals, language can signal social spaces that are safe for them, as discussed in more detail in the following section. Navigating social safety in interactions is a salient issue for queer people as seen in work by Khoo and Ilbury (2024) on the style-shifting of gay men in unsafe heteronormative spaces. Nonbinary people can have differing experiences with (un)safety because of the intersectionality of their other traits, such as race, as Steele (2022) shows with the "double-countercultural position" of Black nonbinary people. However, a common concern for nonbinary speakers is that being perceived as gender non-normative in many situations can be less safe than adhering to conventional expectations (Steele 2024). Nonbinary speakers have been observed to modify their speech in queer versus non-queer social contexts and with nonbinary interlocutors versus cisgender interlocutors (Gratton 2016, 2017). Gratton (2016) proposed that these patterns were due to the routine *threat of being misgendered* in non-queer spaces, and the nonbinary speakers shifted their usage of specific linguistic variables as a means of mitigating this social threat.

The present study uses a phonetic imitation shadowing task to test the effect that social information about an unknown interlocutor has on nonbinary participants' speech production. I hypothesized that nonbinary speakers would show higher rates of convergence toward a nonbinary-identified model talker than a binary-identified model talker, given the patterns observed for nonbinary speakers in previous research. The results showed a subtler effect: Nonbinary speakers diverged from all model talkers, but they diverged the *least* from a nonbinary-identified model talker. While these results were not expected by the hypothesis, I draw connections between prior phonetic convergence research and recent social psychology and queer theories to argue that these nonbinary speakers are using linguistic divergence to create interactional social distance due to the routine threat of marginalization and minority stress that nonbinary individuals experience.

2 | Nonbinary Gender, Minority Stress, and Queer Spaces

A prevailing perspective in sociology and sociolinguistics has been that gender is socially constructed through the repetition of stylized acts (Butler 1988). This view has led to a better understanding of the societal naturalization of the gender binary, a reframing of "the gendered voice" within sociolinguistics (Zimman 2017), and the legitimization of genders that are not binary (Richards et al. 2017). Even with the gradual acceptance of nonbinary identities within academic spheres, the hegemonic power of the gender binary as a culturally enforced system often excludes and punishes those who act outside of the system's dialectic (Butler 1994). Nonbinary individuals face unique issues from challenging this cultural system, such as the need to strategically use social resources to construct legible identities in cisnormative spaces and the possibility of marginalization in both cis and queer communities (Goldberg and Kuvalanka 2018). *Nonbinary* is used in this article to refer to people with genders that do not align with a static female–male binary, as well as identities that resist the label of any gender at all. It is important to understand nonbinary identities as separate from cisnormative conceptions and not inherently along a continuum between men and women. This disalignment with binary gender is reflected in the pronouns commonly used by nonbinary individuals, which in English include singular *they/them* and neo-pronouns like *ze* or *hir* (Konnelly et al. 2023). Crucially, nonbinary individuals can still experience marginalization or delegitimization of their identity within queer/trans spaces due to the pervasiveness of cisnormativity (an ideology that presupposes individuals should be cis, privileges cis people, and erases the experiences of those who are not cis) and transnormativity (an ideology that presupposes trans identities should adhere to the social norms of the cisnormative gender binary; A. H. Johnson 2016).

These normativities can manifest in language as *misgendering*: the act of referring to someone in a way that does not align with their gender. For nonbinary individuals, instances of misgendering are reported to be a significant stressor that contributes to negative mental health because these acts reinforce the stigmatization of their identity (K. C. Johnson et al. 2020). Being misgendered can cause a person psychological distress and emotional harm, and nonbinary individuals often actively employ semiotic strategies to avoid being misgendered in normative settings (Ackerman 2019). Because misgendering is a prevalent occurrence for nonbinary individuals, the possibility of having others incorrectly assume one's gender has been referred to as the *threat of being misgendered* (Gratton 2016).

The excess stress that individuals from marginalized groups experience due to their social minority status has been termed *minority stress*. Minority stress is distinguished from general stress because its chronic, socially based nature requires marginalized individuals to put forth more effort than individuals who are not marginalized (Meyer 2003). Along with chronic instances of external marginalization and discrimination, minority stress occurs through the "expectations of such events and the vigilance this expectation requires" (ibid., 676). The awareness of the threat of being misgendered is one manifestation of the expectations that nonbinary individuals have about being marginalized in social interactions (McLemore 2015). Minority stress can also be present due to difficulties in intergroup relations or intragroup conflict (Linley 2018), which for nonbinary individuals can be understood as discrimination in cis spaces or marginalization of nonbinary identities in queer spaces, respectively (Cordoba 2023).

Applying concepts of minority stress to linguistic research, Holliday and Squires (2021) found that the sociolinguistic labor of self-monitoring performed by black undergraduate students at predominantly White institutions contributed to feelings of minority stress. Participants were reported to have a "linguistic hyperawareness" due to the potential social consequences of presenting the "'wrong' version of themselves, both socially and linguistically, in a given social situation" (ibid., 432). Similarly, presenting as nonbinary is not only a performance of gender like men or women do, but it is also a navigation of safety to avoid negative social consequences. When gender identity is more salient, such as a speaker being the only perceived queer person in a non-queer space, it can cause a speaker to negotiate the display of their identity in a way that secures their safety (Gratton 2017).

In the context of marginalized communities, safe spaces represent settings where members of marginalized groups are promised they can express their identity without fear of stigmatization or harm (Waugh 2019). Because not all social interactions occur within safe spaces, marginalized individuals often must evaluate contexts for their perceived level of safety when interacting with others (Gratton 2017; Khoo and Ilbury 2024). Nonbinary individuals may feel it is more likely for their identity to be understood and respected in queer spaces, and there is less risk of being misgendered. However, queer spaces can still reflect hegemonic gender binary ideologies in ways that minoritize nonbinary identities in favor of more gender-conforming queer identities, such that nonbinary individuals have reason to believe that others may misgender them if a queer setting is not identified as being nonbinary-inclusive (Cordoba 2023). The signaling of nonbinary-inclusive spaces through language has been observed to be "a critical element in countering the negative effects of misgendering," even in queer community spaces (ibid., 90). As such, nonbinary speakers may strategically use gendered language patterns to construct their desired personae, but simply extrapolating on the patterns observed with men and women is not sufficient for a sociolinguistic account of nonbinary speakers.

3 | Social Information in Phonetic Imitation

This study looks at the impact social information has on nonbinary speakers' linguistic behavior in a phonetic imitation shadowing task. Phonetic imitation (sometimes called phonetic convergence) is a speech production process "in which a talker takes on acoustic characteristics of the individual they are interacting with" (Babel 2012, 178). Phonetic imitation falls within the broader category of linguistic accommodation, and accommodation has been described as a process where speakers alter their communication to decrease or increase the social distance between themselves and others (Gasiorek et al. 2015). Accommodation is realized through convergence and/or divergence, with convergence occurring when a speaker's speech style becomes more like that of their interlocutor and divergence occurring when a speaker's speech style becomes less like their interlocutor's. Convergence is thought to be motivated by interactional goals that decrease social distance with an interlocutor, such as highlighting shared social identities. In contrast, divergence is thought to be the result of a speaker wanting to maintain or increase social distance with an interlocutor (Gasiorek et al. 2015). Accommodation theory delineates interpersonal communication from intergroup communication, with intergroup communication occurring when a speaker views themself or others in relation to their social group identity as opposed to their individual identity (Giles and Hewstone 1982).

Previous studies have provided evidence that phonetic imitation is facilitated by social information. Babel (2012) found that participants who saw a picture of a model talker imitated that talker's vowels more than participants who did not see a picture of the talker. Additionally, male participants who rated the male model talker's picture as attractive were more likely to diverge from that talker, and it was argued that these participants "were, perhaps, *socially threatened* and distanced themselves in response to the threat" (ibid., 8, emphasis mine). In a study on VOT imitation, Yu et al. (2013) observed that participants with a positive impression of a model talker were more likely to converge toward the model's extended VOT, whereas participants with a negative impression of the model talker were more likely to diverge from the extended VOT. Babel (2010) found that speakers of New Zealand English were more likely to accommodate to Australian English vowels if they had a positive view of Australia, showing that prior world knowledge and biases can impact accommodation. The results of these studies support the claim from Delvaux and Soquet (2007) that speakers tend to automatically phonetically converge with other speakers *unless* there is a salient social reason for a speaker not to do so, such as a desire to distance oneself from a social group or individual. This has manifested in the inconsistent interactions between gender and phonetic imitation in previous studies, with results showing women imitating more than men (e.g., Namy et al. 2002), men imitating more than women (e.g., Pardo 2006), and failing to find a significant effect for participant gender (e.g., Pardo et al. 2013; Pardo et al. 2017; Schertz and Johnson 2022). This leads to the argument that gender by itself is not sufficient to induce imitation, and the gender differences seen in some studies were likely driven by additional factors.

The findings on phonetic imitation demonstrate that speakers exhibit phonetic imitation in minimally social laboratory settings (Goldinger 1998; Shockley et al. 2004; Wade et al. 2021) and in online experiments (Clare and Schertz 2022; Schertz et al. 2023). Studies have shown that speakers require little time to begin imitating another speaker, and this imitation persists after the speakers are done interacting (Pardo 2006). The persistence of imitation after the exposure interaction seems to not be affected by whether the experiment uses an imitation task, where participants are explicitly instructed to imitate a model speaker, or a shadowing task, where participants listen to and repeat productions from a model speaker without being instructed to imitate the model speaker. Dufour and Nguyen (2013) conducted a study comparing the vowel productions of imitation task participants and shadowing task participants, and the findings showed that both groups of participants had similar levels of convergence post exposure even though the imitation task participants had much higher levels of convergence during exposure. Following this body of work, the present study used a shadowing task experiment to investigate if nonbinary participants are more likely to converge with a model talker when they believe the model talker is also nonbinary.

4 | The Present Study

With the understanding that non-queer spaces can heighten minority stress for nonbinary speakers in comparison to queer spaces (Darwin 2017; Goldberg and Kuvalanka 2018; Konnelly 2021), binary contexts could potentially motivate nonbinary speakers to maintain social distance, and nonbinary contexts could facilitate nonbinary speakers to imitate another's speech. Previous research has observed that nonbinary participants vary their linguistic patterns in queer contexts, compared to non-queer contexts (Gratton 2016, 2017). However, this research did not investigate potential effects of interlocutor and level of familiarity, so it is unclear what differences exist between socio-situational factors and interpersonal orientation factors for this sociophonetic variation (Bell 1984; Childs 2019). The present study aims to build upon previous observations by investigating

the degree to which social context affects the amount of phonetic imitation exhibited by nonbinary speakers when interacting with an unfamiliar interlocutor.

5 | Methods

The experiment was conducted in the United States in the early 2020s with 45 nonbinary American English speakers. The experimental paradigm was an input-driven shadowing elicitation task with participants being assigned to one of three conditions. These conditions aimed to replicate the social contexts of nonbinary space, binary space, and ambiguous (or neutral) space by presenting participants with recordings from a model talker who either identified as nonbinary, identified with an unambiguously masculine name and *he*/*him* pronouns, or did not give any gender identity information. If a difference in phonetic imitation *is* seen in the three different conditions, this would be consistent with the social context effects of the model talker either sharing a marginalized nonbinary identity with the participant or not sharing this identity with the participant.

5.1 | Stimuli

The variable used in this study to measure phonetic imitation was voice onset time (VOT). For this experiment, VOT is the duration of time between the release of a stop consonant and the onset of voicing and is equivalent to a practical measurement of the aspiration of voiceless stops. VOT with atypically long duration, or *extended VOT*, has been well documented as a phonetic object that can be the target of convergence (e.g., Nielsen 2011; Paquette-Smith 2018; Shockley et al. 2004). Past phonetic imitation studies with extended VOT have shown convergence effects as small as 0.47 ms and as large as 12.3 ms as shown in Appendix A. Extended VOT was chosen because it has no phonological perception consequences for voiceless stops in English and stimuli are unproblematic to create artificially through acoustic manipulation; moreover, extended VOT was selected for this experiment because it is not known to be stereotyped to gender (Nielsen 2011). Given that there are myriad nonbinary identities and there is not a singular, unified way to perform these identities, nonbinary speakers use heterogeneous sociolinguistic strategies to index their gender as seen with previous studies on nonbinary /s/ articulation and (ING) variation (Calder and Steele 2025; Gratton 2016). In the context of this experiment, using a gendered variable would leave open the possibility that differences in production would be due not to experimental conditions but to differences in gender performance. In other words, using a non-gendered variable allows the results of the study to be more easily interpreted as being influenced by the different social cues of the three experimental conditions.

The stimuli consisted of 54 words, with 40 target words and 14 filler words. All stimuli words were disyllabic and stress-initial with a SUBTLEXUS frequency between 1 and 25 per million (Brysbaert and New 2009). Low-frequency words were chosen because they have been shown to be imitated more than high-frequency words (Goldinger 1998). High-frequency words also have a higher likelihood of irregularities in their realization, such as lenition (Bybee 2000). As previous studies on VOT imitation have both included /t/-initial words (Shockley et al. 2004; Wade et al. 2021) and excluded /t/-initial words (Nielsen 2011; Paquette-Smith et al. 2022), the target words for this study were 16 /p/-initial words, 16 /k/-initial words, and 8 /t/-initial words. No target words had initial onset clusters. All 14 filler words began with vowels. Stimuli words and their frequencies are given in Appendix B.

The model talker was a White, college-educated, 24-year-old American English speaker from central Michigan who self-described as queer, agender, and bisexual. This model speaker was chosen after being determined to sound appropriately gender-ambiguous to listeners via a pre-experiment norming study. The pre-experiment norming study presented recordings from four potential model talkers to 22 listeners who rated their perception of the models' voices as "very masculine," "slightly masculine," "ambiguous," "slightly feminine," or "very feminine." All four potential model talkers identified as nonbinary. The model talker that was chosen had the highest number of "slightly masculine" responses, as this would allow them to reasonably be perceived either as a man or as nonbinary depending on the social information presented to the listener. The model talker provided recordings of the 54 stimuli words in isolation without a carrier phrase, as well as the audio instruction portion of the experiment.

These recordings were modified to ensure the extended VOT was prevalent enough to be a target for convergence. The original VOT of initial consonants was measured and then extended using the Duration Tier in Praat's manipulation features (Boersma and Weenink 2022) to create VOTs that were, on average, 102% longer than the original VOT (mean increase in duration = 56.73 ms, standard deviation = 11.99 ms). This method was chosen to avoid auditory aberrations, such as aperiodic bursts, which can occur when manipulating VOT through other means. The target duration of the token was allowed to vary to maintain the sound of naturalistic speech in the modified recordings. No other modifications were made to the model talker's recordings. Figure 1 shows the duration of the original VOT and the extended VOT of the model talker's recordings. As shown in Appendix A, this modification of VOT duration is consistent with past studies.

5.2 | Participants

The analysis presented here includes 45 participants; 51 participants met the eligibility criteria for the study, but six were excluded due to audio issues with their recordings. All 45 participants analyzed in this study completed all components of the task with high-quality recordings containing little to no background noise. Participants were recruited through the researcher's connections within queer communities and through online social media groups. Only one participant was a contact previously known to the researcher. Participants were American English speakers between the ages of 18 and 35 (mean age 26.6 years) who identified as nonbinary and reported that they were born and currently live in the United States. 42 participants self-selected their gender as "Nonbinary" without providing additional information, and three participants provided more specific labels (*genderfluid*, *demigirl*, *genderqueer*). At the time of study, participants were geographically distributed across dialect regions: Western (n = 12), Midland (n = 11), Northern (n = 10),

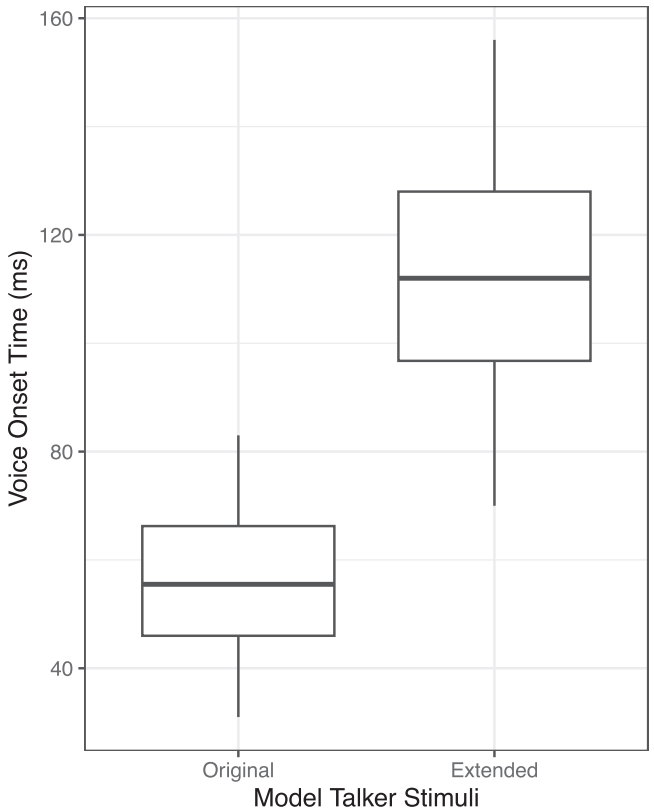

FIGURE 1 | Box plot of the original VOT duration and the extended VOT duration for the target word stimuli.

Greater New York City (n = 6), Southern (n = 5), and New England (n = 1). For the participants' reported highest level of completed education, 18 participants had some college education, 15 participants had an undergraduate degree, 10 participants had a graduate degree, and two participants had a high school education. 37 participants identified as White/Caucasian, five participants identified as Asian or Pacific Islander, and three participants identified as Hispanic/Latinx. Choosing to only recruit nonbinary participants was done to provide a clearer interpretation of the results as there would be fewer cross conditions in the analysis of the data. The study took approximately 15 min to complete, and participants received a $5 Amazon gift card as compensation.

5.3 | Procedure

The experiment consisted of an input-driven shadowing elicitation task where each participant was assigned to one of three conditions for a between-subject experiment design (with 15 participants per condition). The experiment began with an informed consent form and a demographic survey. Participants then recorded themselves speaking the stimuli words within the carrier phrase, "The word is ____." Stimuli words were presented to participants across three phrases (before, during, and after exposure to a model talker). This flow is shown in Figure 2. Phase 1 (Baseline phase) elicited participants' baseline productions by presenting written instructions and words on the screen without auditory exposure. Phase 2 (Exposure phase) presented participants with audio instructions and words read aloud by the model talker. Audio instructions were given by the model talker so participants could familiarize themselves with the model's speech before being given the stimuli words. All audio stimuli during the Exposure phase contained artificially extended VOT, which is consistent with previous VOT imitation experiments (e.g., Nielsen 2011; Wade et al. 2021). Phase 3 (Post-exposure phase) was the same as the Baseline phase in that it presented participants with written words exclusively and no audio stimuli. The order in which the words were presented in each phase was randomized for all participants.

The experiment was conducted online using PsychoPy (Peirce et al. 2019). While most previous studies on VOT imitation have been conducted in-person in laboratory settings, some studies have been conducted online (e.g., Clare and Schertz 2022). Importantly, Schertz et al. (2023) reported results of online experiment participants imitating both lengthened VOT and shortened VOT. Due to the remote nature of the present experiment, the recordings were participant-paced to ensure that participant productions could be fully recorded. The use of a carrier phrase also helped mitigate the possibility that participants would produce the target word before the recording had started. The experiment was designed such that recordings were at least two seconds in duration and recordings during the Exposure phase could not be started until the audio stimulus finished playing. The online nature of the experiment meant that listening conditions were not as controlled as a lab setting; however, the lack of background noise in participant recordings indicates that participants performed the task in environments that allowed them to hear the audio stimuli comparatively well. Participants were automatically presented with the next stimulus 1 s after indicating they had completed their recording. The mean duration of time that participants spent between trials was 4.26 s.

5.4 | Conditions

To manipulate the variable of the model talker's perceived identity, participants were given auditory instructions from one of three conditions during the Exposure phase. The Nonbinary condition began with the model talker explicitly identifying as nonbinary ("My name is Sam. I am nonbinary and my pronouns are *they*/*them*"). In the Neutral condition, the model talker did not give any information about gender ("My name is Sam"). The Binary condition began with the model talker identifying themself with an unambiguously masculine name and *he*/*him* pronouns ("My name is Grant and my pronouns are *he*/*him*"). The Binary condition included pronouns to ensure that the salience of the model talker's gender was comparable to the Nonbinary condition. Additionally, pronoun sharing does not inherently indicate a space is safe for nonbinary identities (Brown 2025).

The model talker's name differed in the Binary condition because English names do not have morphological gender, but English speakers presumably assign gender features to names based on stereotypes or statistical probabilities (Ackerman 2019). The name "Grant" was chosen as it is almost exclusively used as a men's name in the United States, with baby name data from the US Social Security Administration showing that 99.8% of individuals named Grant are assigned male at birth. In contrast, US Social Security Administration data shows that 60.3% of individuals

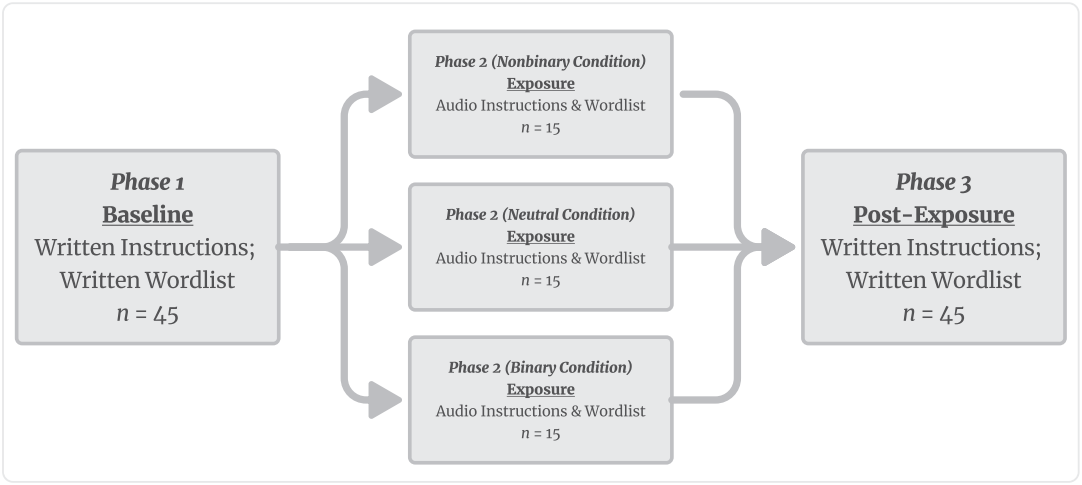

FIGURE 2 | Flow diagram of the Shadowing Task, with *n* counts representing the number of participants in each phase and condition.

named Sam are assigned male at birth (Wickham 2021). However, work by Gardner and Brown-Schmidt (2024) has shown that English speakers tend to assume that people are men even when they are presented with first names that are statistically ambiguous. Because the usage of *they/them* pronouns is arguably more socially marked than using binary gender pronouns, the decision was made to change the name in the Binary condition to weight it more toward a normatively masculine interpretation. In other words, "My name is Sam. I am a cis man and my pronouns are *he/him*" is not necessarily the unmarked binary equivalent of "My name is Sam. I am nonbinary and my pronouns are *they/them*." Using a name that is unambiguously associated with men in the Binary condition helped to establish the three conditions as substantively different from one another.

Aside from introductory identity information, the recordings for the model talker were identical in each condition. This was achieved through recording the introductory lines separately and inserting them at the beginning of the audio instruction recording. As a result, the instruction recordings for the Nonbinary and Binary conditions had extended VOTs for 17 stop-initial words and the Neutral condition had extended VOTs for 16 stop-initial words (due to omitting the word "pronouns"). The recordings were from the same model talker in each condition, and the pre-experiment norming study on the model's gender ambiguity aimed to mitigate effects that would cause participants to form strong assumptions about the gender of the speaker in the Neutral condition. The structure of these conditions was motivated by the hypothesis that nonbinary speakers are more likely to converge with a model talker they perceive as nonbinary. Even in the limited interaction situation of an online shadowing task, participants in the Nonbinary condition were involved in a virtual space with a nonbinary model talker, while participants in the Binary condition were involved in a virtual space that was not explicitly nonbinary-inclusive.

5.5 | Hypotheses and Analysis

The primary hypothesis for this experiment was that nonbinary speakers would show greater convergence toward a nonbinary-identified model talker than a binary-identified model talker. This expectation is based on nonbinary speakers navigating the potential social threat of being in an interaction where it is unknown if the interlocutor is accepting of nonbinary identities. If the results were to corroborate this hypothesis, then the interaction between condition and Exposure phase would show participant VOT duration increasing most in the Nonbinary condition and least in the Binary condition, with the Neutral condition falling between the Binary and Nonbinary conditions.

My secondary hypothesis was that the Nonbinary condition would elicit greater convergence in the Post-exposure phase than the Binary and Neutral conditions, as participants would have stronger intragroup interactional motivation to maintain convergence as a way of highlighting the social identity they share with the model talker. The results would confirm this secondary hypothesis if participant VOT duration in the Post-exposure phase increased most in the Nonbinary condition and least in the Binary condition. Such results would indicate that nonbinary participants have relatively higher rates of convergence when shadowing a nonbinary-identified model talker.

To test these hypotheses against the data, participant recordings were transcribed orthographically and then force-aligned using the Montreal Forced Aligner (McAuliffe et al. 2017) via DARLA (Reddy and Stanford 2015). Interval boundaries for VOT and word duration of all target words were then manually adjusted and measured in Praat (Boersma and Weenink 2022), with assistance from the get_vot script (Kang and Whalen 2017). The VOT measurements were analyzed using a linear mixed-effects model in R via the lmerTest package (Kuznetsova et al. 2017). The dependent variable was VOT duration ($n = 5400$; 45 participants × 40 target words). Predictors were Phase (Baseline, Exposure, and Post-exposure), Condition (Neutral, Binary, and Nonbinary), initial stop (/k/, /p/, /t/) and, following Wade et al. (2021), rest of word duration (referred to as ROW), calculated as the duration of the target word minus VOT. An interaction between Phase and Condition was included in the model. Random intercepts were included for speaker and word. Random slopes were included for phase by speaker. To facilitate the between-condition comparisons that are central to the research hypotheses, I coded

TABLE 1 | Results of the mixed-effects model for shadowing task.

Term	Estimate	Standard error	Degrees of Freedom	*t*-value	*p*-value
(Intercept) [Neutral Condition Baseline Phase VOT for /k/-initial words with mean ROW]	89.51168	4.30836	82	20.776	<0.0001
PhaseExposure	−8.38462	2.02995	46	−4.130	0.0002
PhasePost-exposure	0.63142	1.95959	45	0.322	0.74
ConditionBinary	5.93321	4.74628	45	1.250	0.22
ConditionBinary: PhaseExposure	−5.81067	2.85867	45	−2.033	0.048
ConditionBinary: PhasePost-exposure	−9.36937	2.76234	44	−3.392	0.0014
ConditionNonbinary	−4.79930	4.74717	45	−1.011	0.32
ConditionNonbinary: PhaseExposure	3.44893	2.85936	45	1.206	0.23
ConditionNonbinary: PhasePost-exposure	−0.92247	2.76277	46	−0.334	0.74
ROW [rest of word duration]	0.02525	0.00406	4809	6.225	<0.0001
Initial Stop /p/	−14.49908	3.82545	40	−3.790	0.0005
Initial Stop /t/	0.11382	4.68506	40	0.024	0.98

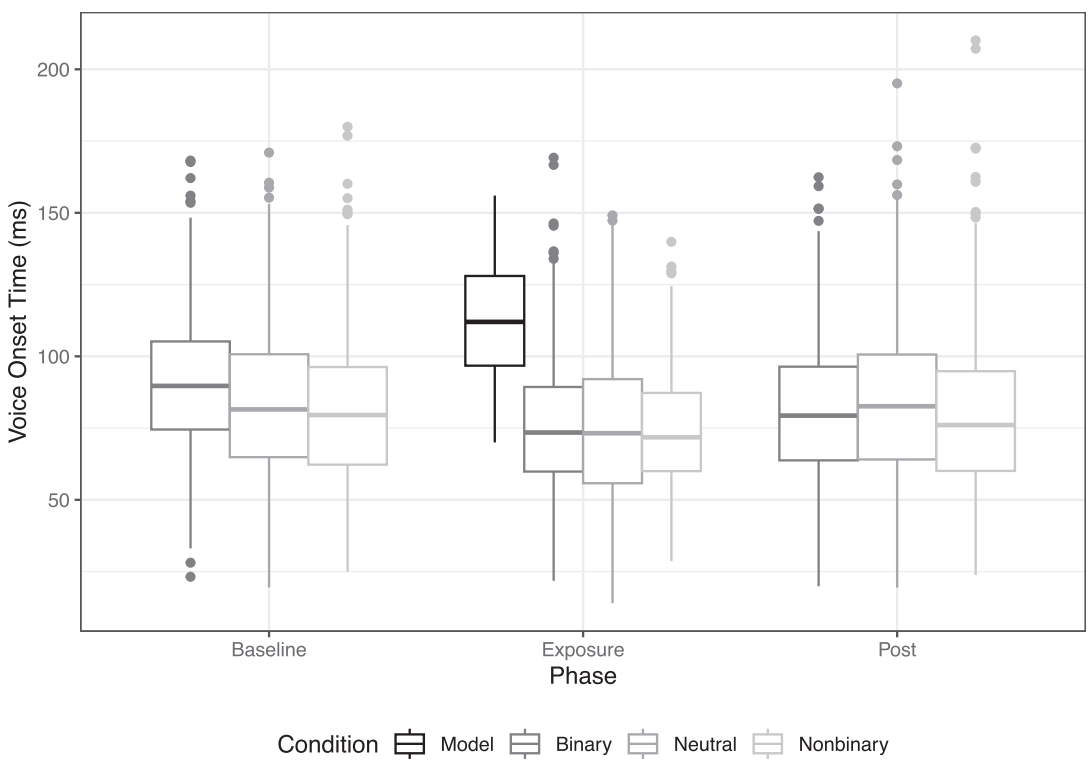

FIGURE 3 | Raw VOT values for model talker and participants across the three conditions.

the Neutral condition as the reference level. The results of the mixed-effects model are presented in Table 1.

6 | Results

Unexpectedly, all conditions saw a decrease in participant VOT values during the Exposure phase, compared to their Baseline phase (Figure 3). It should be noted that the average of the model talker's extended VOT was longer than the average baseline VOT production for any of the participants. Research has shown that listeners are attentive to linguistic productions outside their range of variation, and these outlier productions are integrated into listeners' perceptual means (Uehara and Wagner 2018). As such, the decrease in participant VOT values does not show convergence to the model talker but rather suggests that participants diverged from the model talker. Interpreting this as divergence is further supported by the presence of a significant main effect for initial stop, with /p/ showing significantly shorter VOT ($p < 0.001$). This phonetic effect aligns with previous work on VOT in American

English word-initial voiceless stops (e.g., Nearey and Rochet 1994; Yao 2007). Divergence in VOT imitation studies has been attested in prior research, with Wade et al. (2021) showing that some experimental participants consistently and categorically diverged from model talkers. Wade et al. (2021) suggest that the reduction of VOT may have been due to task effects, such as participants hypo-articulating in later phases as they became more familiar with the task (see also Nielsen 2011), or the decrease in VOT may have been the result of socially mediated divergence. The possibility of these two interpretations motivated the inclusion of ROW in the model, which is discussed more below, to disambiguate the effects of global shifts in word productions and the effects of social divergence. While both hypotheses anticipated convergence, the primary object of interest was the differences in *magnitude* of VOT change across the three conditions. Even if participants diverged from the model talker because of perceived characteristics other than gender, the only difference between conditions was the identity information given by the model talker. Thus, the results still allow for an investigation of the effect that social information had on participants' VOT productions.

The average VOT value was 89.51 ms for the intercept term, corresponding to participants' /k/-initial productions in the Baseline phase of the Neutral condition when ROW is 426.2 ms (mean ROW across trials). Importantly, the average Baseline VOT values in the Binary and Nonbinary conditions (reflected in the ConditionBinary and ConditionNonbinary model terms) did not differ from the average Baseline VOT values in the Neutral condition to a statistically significant degree ($ps \geq 0.22$). This is true even when the model only considers data from the Baseline phases: The only significant effects for Baseline phase across the three conditions are the initial stop and ROW.

In the Exposure phase of the Neutral condition, participants diverged from the model talker, with a significant *decrease* in VOTs of 8.38 ms ($p < 0.001$). The Binary condition had two significant interactions with Phase ($ps < 0.05$). Participants in the Binary condition showed greater divergence in the Exposure phase than those in the Neutral condition (an additional 5.81 ms shorter). The second significant interaction for the Binary condition was in the Post-exposure phase, where participants maintained their divergence by producing VOTs that were 9.37 ms shorter than their Baseline VOTs. The Nonbinary and Neutral conditions did not show significant effects for the Post-exposure phase, meaning the Binary condition was the only one to show participant divergence persisting after exposure to the model talker. While none of the phases in the Nonbinary condition reached statistical significance, the Exposure phase of the Nonbinary condition showed *less* divergence than the other conditions, with VOTs that were 4.93 ms shorter than Baseline.

ROW showed a positive significant effect on VOT duration ($\beta = 0.03$, $p < 0.0001$) indicating that words with longer duration were produced with longer VOT. The phase with the highest mean ROW was the Baseline phase (456.65 ms), compared to the Exposure phase (406.82 ms) and Post-exposure phase (415.14 ms). This provides some explanation for participant VOT values decreasing after the Baseline phase. The decrease in VOT, however, cannot be completely accounted for by the decrease in ROW—the effect size shows that the impact of ROW on VOT is small, with VOT increasing by only 1 ms for every 40 ms increase in ROW. Looking at Baseline ROW by condition reveals that the Binary condition had the shortest mean ROW at 443.80 ms, compared to 451.16 ms for the Neutral condition and 474.99 ms for the Nonbinary condition. The distribution of ROW values by phase across conditions is given in Figure 4. Importantly, we still see significant main effects for the interactions between Condition and Phase, so the shifts in VOT duration cannot be accounted for solely by global shifts in word duration across the phases.

7 | Discussion

This experiment examined extended VOT imitation by 45 nonbinary participants across three different conditions in a shadowing task. I predicted that nonbinary speakers would show stronger convergence in the condition where the model talker was identified as nonbinary (Nonbinary condition), compared to the other conditions. This prediction was based on previous observations suggesting the threat of being misgendered is a primary motivation for nonbinary speakers shifting their linguistic productions in differing social contexts (Gratton 2016, 2017). The results showed a surprising tendency for participants in all three conditions to diverge from, rather than converge with, the model talker's extended VOT.

Incorporating concepts of minority stress provides one possible explanation for this divergence. An explanation for this divergence that incorporates minority stress would be that these nonbinary participants are generally wary of unknown interlocutors and maintain social distance to ensure social safety, and presumptive markers of shared identity (e.g., pronoun preference) are not sufficient indicators of safety to mitigate this wariness. It is also possible that the position of nonbinary identities gives these participants a reason to disalign with an unknown speaker, with the non-normative stance of nonbinary identities becoming linked with transgressiveness, countercultural attitude, or "alternativeness" (e.g., Steele 2022) and leading to divergence being *part of* a nonbinary style. In this account, the convergence and divergence are themselves semiotic resources for marking identity, regardless of the status of the other interlocutors. More research is needed to tease these two possibilities apart, but the overall trend of convergence in previous VOT imitation studies suggests that the underlying cause of divergence in this study is more than the usual cross-study perturbation.

The results for ROW provide evidence that there is an underlying cause for this divergence. It was previously mentioned that participants could have produced words during the Baseline phase in a hyper-articulated style with longer word durations that resulted in longer VOT, and the decrease in VOT in the subsequent phases was due to participants becoming familiar with the task and returning to a less hyper-articulated style. If this were the case, then we would expect the condition with the largest decrease in VOT across phases to have the longest ROW in the Baseline phase and the condition with the smallest decrease in VOT to have the shortest ROW in the Baseline phase. Instead of this, the results show the opposite trend: The Binary condition had the largest decrease in VOT and the shortest mean Baseline ROW, while the Nonbinary condition had the smallest decrease in VOT and the longest mean Baseline ROW. These findings support

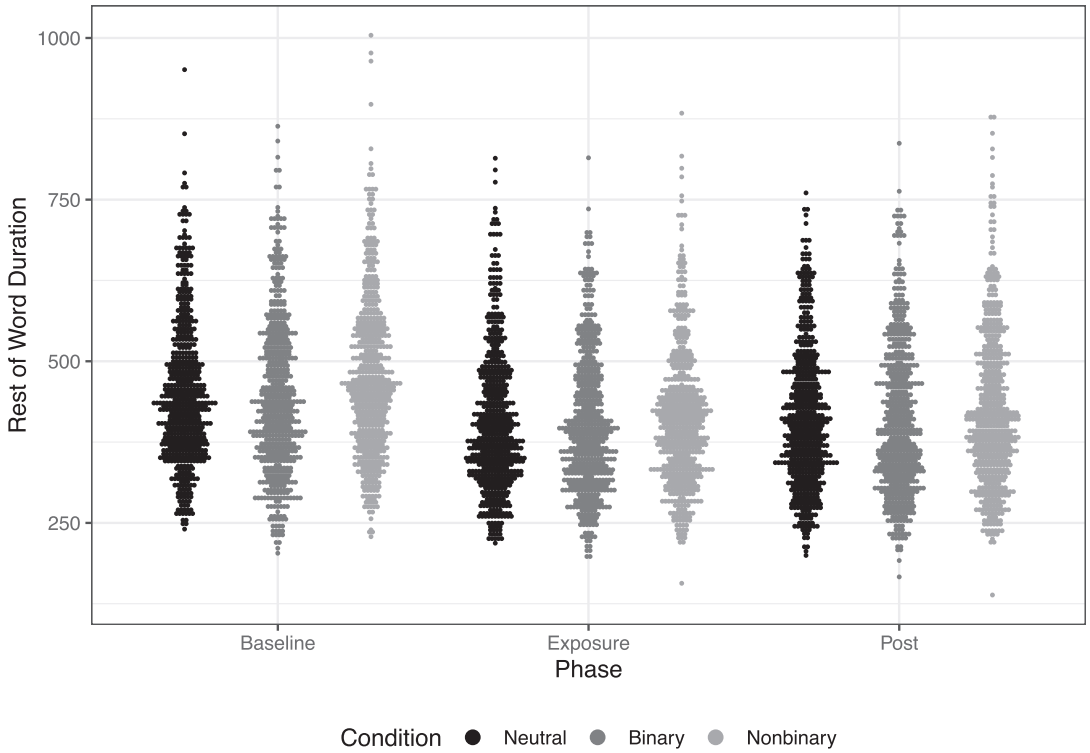

FIGURE 4 | ROW values of participants by phase across conditions.

the interpretation that this decrease in VOT is the result of socially mediated divergence.

The divergence seen here is not incompatible with previous studies, which have found mixed results for participants imitating shortened VOT (Nielsen 2011; Schertz et al. 2023) and have provided evidence that participants can consistently diverge in shadowing tasks (Wade et al. 2021). It could be argued that the experimental designs in past studies of VOT imitation have been influenced by the expectation of finding convergence; for instance, Wade et al. 2021, 579) states that "After participants failed to converge in an initial pilot of the experiment, we made several design decisions in order to increase the motivation to converge." There have been exceptions to this; Yu et al. (2013) found that participants diverged from a model talker's extended VOT when the participants had a negative attitude toward the model talker. This effect of attitude has parallels with the present study's investigation of interlocutor effects by having nonbinary participants engage with experimental conditions where the model talker either does or does not saliently share a nonbinary identity with the participant. It has been argued that intergroup interactions are more likely to lead to divergence than interpersonal interactions, as speakers may feel a need to assert their membership with a group or feel that a threat is posed to their identity (Dragojevic and Giles 2014). Speakers enter social interactions with evaluations and goals based on previous experiences (Gasiorek et al. 2015), and the general tendency toward convergence can be counteracted by a speaker having a salient reason to maintain distance from their interlocutor (Delvaux and Soquet 2007).

Patterns of consistent divergence from a model talker highlight that phonetic imitation is a process that is subject to social factors (Pardo 2006). Social threat, negative perception of an interlocutor, and biases informed by prior experience have all been argued to play a role in the accommodation strategies used by a speaker (Babel 2010, 2012; Yu et al. 2013). In this case, the difference across conditions also shows the influence of social factors. Nonbinary participants diverged the most in the Exposure phase of the Binary condition with a decrease in VOT durations of 14.19 ms, and this divergence continued into the Post-exposure phase of the Binary condition. The maintenance of this divergence occurring *only* for the Binary condition is especially telling, as it points toward this occurring due to the interactional motivations of the participants and not because of the experimental task or a fully automatic imitation process (Dufour and Nguyen 2013). If divergence in the Post-exposure phase was being caused by a fully automatic process, we would expect to also see continued divergence in the Neutral and Nonbinary conditions, but the results show participants in those conditions moving back toward their Baseline VOT values. I posit that nonbinary participants interpreted a social threat associated with a binary interlocutor that was strong enough to motivate participants to linguistically distance themselves in the Binary condition.

Additionally, Exposure phase VOT values diverged the least in the Nonbinary condition, with a decrease of 4.93 ms as compared to the 8.38 ms decrease in the Neutral condition and the 14.19 ms decrease in the Binary condition. Even with participants diverging in all conditions, these results show that nonbinary participants aligned their speech most closely to a nonbinary-identified model talker. Previous studies have shown that speaker gender does not have a consistent, significant effect on imitation (Namy et al. 2002; Pardo et al. 2013). This is not to say that gender does not matter for imitation or convergence. Phonetic imitation has been said to be "subject to situational constraints that

influence the direction and magnitude" (Pardo 2006, 2391), and this is what the current experiment finds. Different situational contexts—such as whether nonbinary participants have entered an environment that is signaled as a nonbinary space or not—impact phonetic imitation. My interpretation of this finding is that the presence of a binary speaker in a virtual setting was enough of a perceived situational threat to cause nonbinary participants to use a greater magnitude of phonetic divergence to navigate minority stress. This interpretation parallels findings that African American speakers modify their speech to avoid being misunderstood by automated speech recognition systems, a similar manifestation of minority stress in virtual interactions (Mengesha et al. 2021).

Following from this, nonbinary spaces might enable the development of nonbinary styles—potentially because nonbinary speakers engage in less self-monitoring due to lower levels of social threat. These findings align with previous work that found nonbinary speakers patterning more like each other in conversational speech in queer contexts, regardless of assigned gender at birth, which are arguably manifestations of distinct nonbinary speech communities (Gratton 2016; Rechsteiner and Sneller 2023). For linguistic research to account for identities that are not bound to normative standards, an emic approach is important for understanding the subjectivities of these identities without erasing their perspectives through reinscribing hegemonic ideologies like cisnormativity. To corroborate the analysis proposed in this article, future work could look at providing a more nuanced understanding of how nonbinary individuals navigate intragroup *and* intergroup interactions across different contexts.

8 | Conclusion

The present research used a shadowing task to see if the stated identity of a model talker impacted nonbinary speakers' phonetic imitation, as a way of examining how linguistic productions are informed by gender and identity in interactions. The results showed a trend for nonbinary speakers to diverge more from a binary-identified model talker than from an ambiguous or a nonbinary-identified model talker. This might suggest that gender in interactions is not always related to gender performance and is a more complex positioning of relational identities, and investigating this possibility would be a promising direction for future research. Given the surprising nature of these results, it would be worthwhile to determine if similar divergence is seen in imitation studies with speakers with other marginalized identities to determine the best interpretation of these findings.

This research also highlights that social information and identity can still be important in low-interaction, non-conversational settings. Traditional sociolinguistic theories place a high value on "authentic" speech (e.g., Labov 1984), but unmonitored speech may not always present the best data to answer our sociolinguistic questions. Speakers find themselves needing to manage a variety of interactions, and the styles that speakers use in different interactions are instantiations of linguistic variation that tell us about how people are using language to create meaning in the social world. This is especially true for speakers who have generally higher levels of attention to their speech, such as nonbinary and trans speakers (Zimman 2020), given how pervasively non-normative people find themselves within normative spaces. By expanding the types of interactions that we consider to be useful for understanding and analyzing style, we can also expand the questions we ask and our methods for asking them.

Identities that are not captured by binary gender suggest that the expression of gender through linguistic means is an arena with much variation. The results of the study presented here point toward the relationship between identity and language variation being more complicated than what previous theories have considered. It is crucial to consider that the routine expectation of marginalization may cause speakers who experience minority stress to engage with sociolinguistic processes differently or employ entirely different linguistic strategies than speakers with more privileged identities. Patterns that are seen with non-marginalized speakers, like phonetic convergence, may not always be exhibited by marginalized speakers due to the social differences of their lived experiences. The social adaptations that arise from experiencing minority stress highlight the importance for future research to avoid forcing marginalized and intersectional identities into preexisting categorizations that may obscure factors that are important to linguistic behavior.

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Conflicts of Interest

The author declares no conflicts of interest.

References

Ackerman, L. 2019. "Syntactic and Cognitive Issues in Investigating Gendered Coreference." *Glossa: A Journal of General Linguistics* 4, no. 1: 117. https://doi.org/10.5334/gjgl.721.

Babel, M. 2010. "Dialect Divergence and Convergence in New Zealand English." *Language in Society* 39, no. 4: 437–456. https://doi.org/10.1017/S0047404510000400.

Babel, M. 2012. "Evidence for Phonetic and Social Selectivity in Spontaneous Phonetic Imitation." *Journal of Phonetics* 40, no. 1: 177–189. https://doi.org/10.1016/j.wocn.2011.09.001.

Becker, K., S. U. D. Khan, and L. Zimman. 2022. "Beyond Binary Gender: Creaky Voice, Gender, and the Variationist Enterprise." *Language Variation and Change* 34, no. 2: 215–238. https://doi.org/10.1017/S0954394522000138.

Bell, A. 1984. "Language Style as Audience Design." *Language in Society* 13, no. 2: 145–204. https://doi.org/10.1017/S004740450001037X.

Boersma, P., and D. Weenink. 2022. "Praat: Doing Phonetics by Computer (6.3.03)." [Computer software]. http://www.praat.org/.

Brown, C. 2025. "Misgender or Out Yourself: Vulnerability in Pronoun Sharing Practices." *Gender and Language* 18, no. 3: 240–261. https://doi.org/10.3138/gl-2024-18.3-0003.

Brysbaert, M., and B. New. 2009. "Moving Beyond Kucera and Francis: A Critical Evaluation of Current Word Frequency Norms and the Introduction of a New and Improved Word Frequency Measure for American English." *Behavior Research Methods* 41, no. 4: 977–990. https://doi.org/10.3758/BRM.41.4.977.

Butler, J. 1988. "Performative Acts and Gender Constitution: An Essay in Phenomenology and Feminist Theory." *Theatre Journal* 40, no. 4: 519–531. https://doi.org/10.2307/3207893.

Butler, J. 1994. "Gender as Performance: An Interview With Judith Butler." *Radical Philosophy* 67: 32–39.

Bybee, J. 2000. "The Phonology of the Lexicon: Evidence From Lexical Diffusion." In *Usage-Based Models of Language*, edited by M. Barlow and S. Kemmer, 65–85. CSLI Publications.

Calder, J. 2023. "Towards a Queer and Trans Sociophonetics." In *Linguistics out of the Closet*, edited by T. E. Kibbey, 117–138. De Gruyter. https://doi.org/10.1515/9783110742510-006.

Calder, J., and A. Steele. 2025. "Interrogating the Cisgender Listening Subject in the Study of Trans Voices." *Gender and Language* 18, no. 3: 216–239. https://doi.org/10.3138/gl-2024-18.3-0002.

Childs, C. 2019. "Interviewer Effects on the Phonetic Reduction of Negative Tags, Innit?" *Journal of Pragmatics* 142: 31–46. https://doi.org/10.1016/j.pragma.2018.12.020.

Clare, E. J., and J. Schertz. 2022. "The Influence of Heritage Language Experience on Perception and Imitation of Prevoicing." *Languages* 7, no. 4: 302. https://doi.org/10.3390/languages7040302.

Cordoba, S. 2023. *Non-Binary Gender Identities: The Language of Becoming*. 1st ed. Routledge. https://doi.org/10.4324/9781003120360.

Darwin, H. 2017. "Doing Gender Beyond the Binary: A Virtual Ethnography." *Symbolic Interaction* 40, no. 3: 317–334. https://doi.org/10.1002/symb.316.

Delvaux, V., and A. Soquet. 2007. "The Influence of Ambient Speech on Adult Speech Productions Through Unintentional Imitation." *Phonetica* 64, no. 2-3: 145–173. https://doi.org/10.1159/000107914.

Dragojevic, M., and H. Giles. 2014. "2. Language and Interpersonal Communication: Their Intergroup Dynamics." In *Interpersonal Communication*, edited by C. R. Berger, 29–52. De Gruyter. https://doi.org/10.1515/9783110276794.29.

Dufour, S., and N. Nguyen. 2013. "How Much Imitation Is There in a Shadowing Task?" In *Frontiers in Psychology* 4: 346. https://doi.org/10.3389/fpsyg.2013.00346.

Eckert, P., and S. McConnell-Ginet. 1992. "Think Practically and Look Locally: Language and Gender as Community-Based Practice." *Annual Review of Anthropology* 21, no. 1: 461–488. https://doi.org/10.1146/annurev.an.21.100192.002333.

Gardner, B., and S. Brown-Schmidt. 2024. "Biased Inferences About Gender From Names." *Glossa Psycholinguistics* 3, no. 1. https://doi.org/10.5070/G6011185.

Gasiorek, J., H. Giles, and J. Soliz. 2015. "Accommodating New Vistas." *Language & Communication* 41: 1–5. https://doi.org/10.1016/j.langcom.2014.10.001.

Giles, H., and M. Hewstone. 1982. "Cognitive Structures, Speech, and Social Situations: Two Integrative Models." *Language Sciences* 4, no. 2: 187–219. https://doi.org/10.1016/S0388-0001(82)80005-3.

Goldberg, A. E., and K. A. Kuvalanka. 2018. "Navigating Identity Development and Community Belonging When "There Are Only Two Boxes to Check": An Exploratory Study of Nonbinary Trans College Students." *Journal of LGBT Youth* 15, no. 2: 106–131. https://doi.org/10.1080/19361653.2018.1429979.

Goldinger, S. D. 1998. "Echoes of Echoes? An Episodic Theory of Lexical Access." *Psychological Review* 105, no. 2: 251–279. https://doi.org/10.1037/0033-295X.105.2.251.

Gratton, C. 2016. "Resisting the Gender Binary: The Use of (ING) in the Construction of Non-Binary Transgender Identities." *University of Pennsylvania Working Papers in Linguistics* 22, no. 2. https://repository.upenn.edu/pwpl/vol22/iss2/7.

Gratton, C. 2017. "Non-Binary Identity Construction and Intraspeaker Variation." Paper presented at the 2017 LSA Annual Meeting, Austin, TX, January 5–8.

Holliday, N. R., and L. Squires. 2021. "Sociolinguistic Labor, Linguistic Climate, and Race(ism) on Campus: Black College Students' experiences With Language at Predominantly White Institutions." *Journal of Sociolinguistics* 25, no. 3: 418–437. https://doi.org/10.1111/josl.12438.

Johnson, A. H. 2016. "Transnormativity: A New Concept and Its Validation Through Documentary Film about Transgender Men." *Sociological Inquiry* 86, no. 4: 465–491. https://doi.org/10.1111/soin.12127.

Johnson, K. C., A. J. LeBlanc, J. Deardorff, and W. O. Bockting. 2020. "Invalidation Experiences among Non-Binary Adolescents." *Journal of Sex Research* 57, no. 2: 222–233. https://doi.org/10.1080/00224499.2019.1608422.

Kang, J., and D. H. Whalen. 2017. "get_vot Praat Script." [Computer software]. www.github.com/HaskinsLabs/get_vot.

Khoo, J., and C. Ilbury. 2024. "Navigating 'Safe' and 'Non-Safe' Queer Spaces: A Study of Style-Shifting in Singapore." *Journal of Language and Sexuality* 13, no. 2: 201–226. https://doi.org/10.1075/jls.00036.kho.

Konnelly, L. 2021. "Nuance and Normativity in Trans Linguistic Research." *Journal of Language and Sexuality* 10, no. 1: 71–82. https://doi.org/10.1075/jls.00016.kon.

Konnelly, L., K. Conrod, and E. D. Bradley. 2023. "Non-Binary Singular They." In *The Routledge Handbook of Pronouns*, edited by L. L. Paterson, 1st ed., 450–464. Routledge. https://doi.org/10.4324/9781003349891-37.

Kuznetsova, A., P. B. Brockhoff, and R. H. B. Christensen. 2017. "lmerTest Package: Tests in Linear Mixed Effects Models." *Journal of Statistical Software* 82, no. 13. https://doi.org/10.18637/jss.v082.i13.

Labov, W. 1984. "Field Methods of the Project on Linguistic Change and Variation." In *Language in Use*, edited by J. Baugh and J. Sherzer, 28–53. Prentice Hall.

Labov, W. 1990. "The Intersection of Sex and Social Class in the Course of Linguistic Change." *Language Variation and Change* 2, no. 2: 205–254. https://doi.org/10.1017/s0954394500000338.

Linley, J. L. 2018. "Racism Here, Racism There, Racism Everywhere: The Racial Realities of Minoritized Peer Socialization Agents at a Historically White Institution." *Journal of College Student Development* 59, no. 1: 21–36. https://doi.org/10.1353/csd.2018.0002.

McAuliffe, M., M. Socolof, S. Mihuc, M. Wagner, and M. Sonderegger. 2017. "Montreal Forced Aligner: Trainable Text-Speech Alignment Using Kaldi." *Interspeech* 2017: 498–502. https://doi.org/10.21437/Interspeech.2017-1386.

McLemore, K. A. 2015. "Experiences With Misgendering: Identity Misclassification of Transgender Spectrum Individuals." *Self and Identity* 14, no. 1: 51–74. https://doi.org/10.1080/15298868.2014.950691.

Mengesha, Z., C. Heldreth, M. Lahav, J. Sublewski, and E. Tuennerman. 2021. "'I Don't Think these Devices Are Very Culturally Sensitive.'—Impact of Automated Speech Recognition Errors on African Americans." *Frontiers in Artificial Intelligence* 4: 725911. https://doi.org/10.3389/frai.2021.725911.

Meyer, I. H. 2003. "Prejudice, Social Stress, and Mental Health in Lesbian, Gay, and Bisexual Populations: Conceptual Issues and Research Evidence." *Psychological Bulletin* 129, no. 5: 674–697. https://doi.org/10.1037/0033-2909.129.5.674.

Namy, L. L., L. C. Nygaard, and D. Sauerteig. 2002. "Gender Differences in Vocal Accommodation: The Role of Perception." *Journal of Language and Social Psychology* 21, no. 4: 422–432. https://doi.org/10.1177/026192702237958.

Nearey, T. M., and B. L. Rochet. 1994. "Effects of Place of Articulation and Vowel Context on VOT Production and Perception for French and English Stops." *Journal of the International Phonetic Association* 24, no. 1: 1–18.

Nielsen, K. 2011. "Specificity and Abstractness of VOT Imitation." *Journal of Phonetics* 39, no. 2: 132–142. https://doi.org/10.1016/j.wocn.2010.12.007.

Paquette-Smith, M. 2018. The Effect of Accent Exposure on Social Cognition and Language Acquisition in Early Childhood. PhD diss., University of Toronto.

Paquette-Smith, M., J. Schertz, and E. K. Johnson. 2022. "Comparing Phonetic Convergence in Children and Adults." *Language and Speech* 65, no. 1: 240–260. https://doi.org/10.1177/00238309211013864.

Pardo, J. S. 2006. "On Phonetic Convergence During Conversational Interaction." *Journal of the Acoustical Society of America* 119, no. 4: 2382–2393. https://doi.org/10.1121/1.2178720.

Pardo, J. S., K. Jordan, R. Mallari, C. Scanlon, and E. Lewandowski. 2013. "Phonetic Convergence in Shadowed Speech: The Relation Between Acoustic and Perceptual Measures." *Journal of Memory and Language* 69, no. 3: 183–195. https://doi.org/10.1016/j.jml.2013.06.002.

Pardo, J. S., A. Urmanche, S. Wilman, and J. Wiener. 2017. "Phonetic Convergence Across Multiple Measures and Model Talkers." *Attention, Perception, & Psychophysics* 79, no. 2: 637–659. https://doi.org/10.3758/s13414-016-1226-0.

Peirce, J., J. R. Gray, S. Simpson, et al. 2019. "Psychopy2: Experiments in Behavior Made Easy." *Behavior Research Methods* 51, no. 1: 195–203. https://doi.org/10.3758/s13428-018-01193-y.

Rechsteiner, J., and B. Sneller. 2023. "The Effects of Topic and Part of Speech on Nonbinary Speakers' Use of (ING)." *University of Pennsylvania Working Papers in Linguistics* 29, no. 1: 159–166. https://repository.upenn.edu/handle/20.500.14332/58728.

Reddy, S., and J. Stanford. 2015. "A Web Application for Automated Dialect Analysis." In *Proceedings of the 2015 Conference of the North American Chapter of the Association for Computational Linguistics: Demonstrations*, 71–75. Association for Computational Linguistics. https://doi.org/10.3115/v1/N15-3015.

Richards, C., W. P. Bouman, and M.-J. Barker, eds. 2017. *Genderqueer and Non-Binary Genders*. Palgrave Macmillan UK. https://doi.org/10.1057/978-1-137-51053-2.

Schertz, J., F. Adil, and A. Kravchuk. 2023. "Underpinnings of Explicit Phonetic Imitation: Perception, Production, and Variability." *Glossa Psycholinguistics* 2, no. 1. https://doi.org/10.5070/G601123.

Schertz, J., and E. K. Johnson. 2022. "Voice Onset Time Imitation in Teens versus Adults." *Journal of Speech, Language, and Hearing Research* 65, no. 5: 1839–1850. https://doi.org/10.1044/2022_JSLHR-21-00460.

Shockley, K., L. Sabadini, and C. A. Fowler. 2004. "Imitation in Shadowing Words." *Perception & Psychophysics* 66, no. 3: 422–429. https://doi.org/10.3758/BF03194890.

Steele, A. J. 2022. "Enacting New Worlds of Gender: Nonbinary Speakers, Racialized Gender, and Anti-Colonialism." In *The Oxford Handbook of Language and Sexuality*, edited by K. Hall and R. Barrett, 1st ed. Oxford University Press. https://doi.org/10.1093/oxfordhb/9780190212926.013.74.

Steele, A. J. 2024. The Sociolinguistic Construction of Gender Nonconformity Under Hegemony: Nonbinarity, Blackness, and the Possibilities of Resistance. Doctoral Thesis, Ohio State University.

Uehara, S., and S. E. Wagner. 2018. "Progressive Outliers in Listener Perception of Sound Change." *University of Pennsylvania Working Papers in Linguistics* 24, no. 2: 157–166.

Wade, L., W. Lai, and M. Tamminga. 2021. "The Reliability of Individual Differences in VOT Imitation." *Language and Speech* 64, no. 3: 576–593. https://doi.org/10.1177/0023830920947769.

Waugh, C. 2019. "Defence of Safe Spaces: Subaltern Counterpublics and Vulnerable Politics in the Neoliberal University." In *Time and Space in the Neoliberal University*, edited by M. Breeze, Y. Taylor, and C. Costa, 143–168. Springer International Publishing. https://doi.org/10.1007/978-3-030-15246-8_7.

Wickham, H. 2021. "Babynames." https://github.com/hadley/babynames.

Yao, Y. 2007. "Closure Duration and VOT of Word-Initial Voiceless Plosives in English in Spontaneous Connected Speech." *UC Berkeley Phonology Lab Annual Reports* 3: 70031. https://doi.org/10.5070/P71HS7H769.

Yu, A. C. L., C. Abrego-Collier, and M. Sonderegger. 2013. "Phonetic Imitation From an Individual-Difference Perspective: Subjective Attitude, Personality and "Autistic" Traits." *PLoS ONE* 8, no. 9: e74746. https://doi.org/10.1371/journal.pone.0074746.

Zimman, L. 2017. "Gender as Stylistic Bricolage: Transmasculine Voices and the Relationship Between Fundamental Frequency and /s/." *Language in Society* 46, no. 3: 339–370. https://doi.org/10.1017/s0047404517000070.

Zimman, L. 2020. "Transgender Language, Transgender Moment: Toward a Trans Linguistics." In *The Oxford Handbook of Language and Sexuality*, edited by K. Hall and R. Barrett, 1st ed. Oxford University Press. https://doi.org/10.1093/oxfordhb/9780190212926.013.45.

Appendix A: Methods and imitation results of previous VOT studies

Study	Mean increase of participant VOT (number of participants)	Modification of model talker VOT
Nielsen (2011)	6.63 ms ($n = 27$)	VOT extended by at least 40 ms
Paquette-Smith (2018)	11.06 ms ($n = 32$)	VOT extended by an average of 50 ms
Shockley et al. (2004), Experiment 1	5.8 ms ($n = 8$)	VOT extended to twice the original duration on average
Shockley et al. (2004), Experiment 2	12.3 ms ($n = 8$)	VOT extended to twice the original duration on average
Wade et al. (2021), Visit 1	4.1 ms ($n = 23$)	VOT extended by doubling the original duration
Wade et al. (2021), Visit 2	5.2 ms ($n = 23$)	VOT extended by doubling the original duration
Yu et al. (2013)	0.47 ms ($n = 93$)	VOT extended by doubling the original duration

Note: Some values in this table were not directly reported as-is but are instead calculated from reported results.

Appendix B: Stimuli: Words and SUBTLEXUS Frequencies per million (Brysbaert and New 2009)

16 /k/	Frequency	16 /p/	Frequency	8 /t/	Frequency	14 filler	Frequency
carrot	3.82	penny	24.29	Tuesday	23.65	apple	23.67
castle	21.55	pinkie	1.67	turkey	22.61	orange	22.31
cabin	19.65	poker	16.06	tunnel	17.88	expert	22.12
camel	5.02	pollen	1.22	tofu	2.69	April	20.65
compass	4.06	popcorn	9.12	towel	14.16	iron	17.94
cancel	18.29	parent	13.14	tennis	13.63	exit	15.57
concert	17.55	peanut	12.35	timer	6.25	ankle	8.02
cookie	16.71	purple	12.33	tickle	4.80	eagle	11.49
carpet	11.65	picnic	11.69	*Mean*	13.21	intern	4.55
comic	10.82	pillow	11.39			oldest	9.37
cocoa	5.02	pencil	9.86			oven	8.88
collar	10.51	pepper	8.80			inning	2.51
cactus	2.90	password	7.98			onion	4.24
cannon	8.71	pirate	7.35			orbit	5.65
Congress	8.22	puzzle	7.33			*Mean*	12.64
candle	8.02	parrot	3.27				
Mean	10.78	*Mean*	9.87				