



## Research Article

## The effect of long-term second dialect exposure on sentence transcription in noise

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## ABSTRACT

Ninety expatriate and non-migrant listeners in the US and England completed a sentence transcription in noise task (−4 dB SNR), transcribing both English and US speakers. Both non-migrant groups are, relatively, more accurate with their own dialect – they have an own-dialect advantage – and comparatively both expatriate groups show a much smaller advantage, doing better with their non-native dialect than the non-migrants, though critically not worse with their native dialect. Additionally, variation within each subcategory of listener type suggests more fine-grained effects of exposure on transcription accuracy, even for non-migrants. These results show that second dialect exposure does not simply alter pronunciation, but also the ways in which listeners process dialects, and can do so without significantly affecting first dialect perception.

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## 1. Introduction

Because of regional or social mobility, speakers may find themselves immersed in a dialect (D2) different from their native dialect (D1). This exposure often leads to changes in their linguistic system, referred to as *second dialect acquisition*, or SDA (Siegel, 2012). Work in SDA has focused primarily on how contact with a D2 shifts a person's speech production (Chambers, 1992; Hirano, 2008; Hazen & Hamilton, 2008; Nycz, 2013; Payne, 1976; Sankoff, 2004; Shockey, 1984; Tagliamonte & Molfenter, 2007; Walker et al., 1973). However, as Sumner and Samuel (2009) argue, having an accent is an overly narrow view of what it means to have a dialect, since speech *perception* is also shaped by dialectal experience. For example, across a variety of listening tasks, participants are faster or more accurate at responding to familiar vs. unfamiliar dialects (Clopper, Pierrehumbert, & Tamati, 2010; Floccia, Goslin, Girard, & Konopczynski, 2006; McGowan, 2016), and the way in which specific sounds are processed is affected by the status of those sounds in a given dialect (Cutler, Smits, & Cooper, 2005; Hay, Drager, & Gibson, 2018; Labov, Karen, & Miller, 1991; Labov & Ash, 1997; Sumner & Samuel, 2009). Furthermore, we know that exposing adults to a D2, or multiple D2, during an experimental session results in changes to their perception (Bent & Bradlow,

2003; Maye, Aslin, & Tanenhaus, 2008; Walker & Hay, 2015). It is reasonable then to expect that when people move to different dialect regions, the significant and long-term second dialect exposure would not only affect how they speak but also the ways in which they perceive speech.

Studies that have investigated how regional mobility impacts speech perception have, for the most part, shown that exposure to a D2 improves recognition or processing of that dialect, or features of that dialect (Bowie, 2000; Clopper & Pisoni, 2004; Scott & Cutler, 1984). Perhaps the most substantial work on SDA effects on perception to date is by Evans and Iverson, who compare best exemplar locations of Northern England listeners who have stayed in the North compared to those who have moved to London (Evans & Iverson, 2004), and longitudinally in Northern speakers before and after they move to the South of England (Evans & Iverson, 2007). In the first study they find evidence that migrant Northerners perceptually adapt their best exemplar locations depending on the dialect context in a way that non-migrant Northerners do not. In the second study they find no effect of time in the South on general exemplar location or adaptability to voice context. However, because they have production data from these subjects, they are able to show a connection between speakers' speech production and perception: participants who generally sounded more Southern chose more Southern-like best exemplars than Northern-sounding participants.

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Understanding how and why second dialect exposure affects speech perception requires an analysis of what makes understanding unfamiliar accents more difficult than familiar ones in the first place. Van Engen and Peelle (2014), uncontroversially, argue that the processing difficulties associated with accented speech are driven by an acoustic mismatch between the incoming signal and a person's expectations about how a word sounds (expectations based on both their long-term experiences, and their contextually driven expectations). Even when listeners are able to reconcile the mismatch and can accurately identify a word, research suggests that this reconciliation is more cognitively taxing than processing a well-matched token, being slower (Flocchia, Butler, Goslin, & Ellis, 2009; Munro & Derwing, 1995), and ultimately resulting in worse comprehension (Adank, Evans, Stuart-Smith, & Scott, 2009; Major, Fitzmaurice, Bunta, & Balasubramanian, 2002).

If we assume that representations are continuously shaped by experience (Pierrehumbert, 2001, 2006; Walker & Hay, 2011), a simple explanation for improved D2 processing for migrant listeners is that their long-term exposure to a D2 affects their representations, resulting in a closer match to a D2 signal. However, it is unclear whether listeners have distinct representations for each dialect – in which case D2 perception could improve at no cost to the D1 – or whether both dialects share a single representation, such that prolonged input from the D2 would result in an improvement in D2 at a cost to the D1 (Antoniou, Grohmann, Kambanaros, & Katsos, 2016; Hazen, 2001; Siegel, 2012). Exemplar accounts could offer an explanation in-between these two poles: the representation is ultimately shared, but because of the socio-indexical information stored with specific exemplars (Foulkes & Docherty, 2006), external-cues could more strongly activate D1 or D2 exemplars in any given context. In such a system we might see D2-contact resulting in an overall shift towards the second dialect, but should see contextually-activated sensitivity to one dialect versus the other, such that, for example, a migrant speaker's performance with the D1 is better in a D1 compared to a D2 context.

Recent studies have suggested that listeners can perceptually adapt towards a dialect simply because a dialect region is associatively primed (Hay, Warren, & Drager, 2010; Hay, Nolan, & Drager, 2006; Walker, Hay, Drager, & Sanchez, 2018). For example, Hay and Drager (2010) found that merely exposing New Zealand participants to Australian stuffed toys (koalas and kangaroos), as opposed to New Zealand stuffed toys (kiwi birds), caused participants to report hearing a more Australian-like variable in a stimuli matching task. Work in perceptual adaptation more generally suggests that how much a listener perceptually adapts is dependent on their own linguistic system (Hay, Warren, & Drager, 2006, 2010), their experience with the dialects in question (Flanigan & Norris, 2000; Plichta & Rakerd, 2009; Sumner & Samuel, 2009), their experience with the speaker in question (Nygaard, Sommers, & Pisoni, 1994), and perhaps also language ideology (Niedzielski, 1999). Therefore there is reason to think that associatively priming a dialect region prior to a listening task will improve performance with that dialect, but more so for migrant listeners (Evans & Iverson, 2004).

Another reason that migrants might do better than non-migrants with a D2 is because of the possible interaction of speech production and perception: migrants might do better at

listening to a variety that more closely matches their changing speech production. There is a long standing debate about the relationship between production and perception (Liberman, Cooper, Shankweiler, & Studdert-Kennedy, 1967; Perkell et al., 2004), with evidence that changes in one dimension correlate with changes in the other (Babel, Haber, & Walters, 2013; Ghosh et al., 2010; Hay et al., 2006; Shiller, Sato, Gracco, & Baum, 2009), but also evidence that one can be manipulated without changing the other (Kraljic, Samuel, & Brennan, 2008). Sumner and Samuel (2009) investigated how dialectal experience affected cross-dialectal priming in a form priming task, a semantic priming task, and a long term repetition priming task. There were three groups of listeners in the study: non-rhotic listeners who were born and raised in NYC (*Overt NYC*), rhotic listeners who were born and raised in NYC (*Covert NYC*), and listeners who had only recently moved to New York (*GA*). They found that both Overt and Covert NYC listeners were primed by non-rhotic forms in the form priming and semantic priming task, while the GA listeners were not. This suggests that the exposure to non-rhotic forms affected the perception of Covert listeners even though it had not affected their production. However, for the long-term repetition priming, only the Overt NYC listeners were primed by non-rhotic forms. Sumner and Samuel argue that this difference across tasks for the Covert listeners is at the representational level: their exposure to non-rhotic forms allows them to be flexible in short-term processing tasks, but it does not affect their long term representations (see also Clopper, Tamati, & Pierrehumbert (2016)). In reporting related findings, Fridland and Kendall (2012) conclude that “perception appears to depend both on what you yourself produce (i.e. as an individual speaker) and who you are more generally (i.e. as a member of a specific community)” (p. 792, italics in original).

There is another factor to consider in investigating the role of second dialect exposure on perception. While in many usage-based accounts of language, the mental lexicon is shaped by frequency, Sumner, Kim, King, and McGowan (2014) have argued that different types of experiences affect our representations differently: not all experience is equal. Specifically, there is evidence that listeners weight experience depending on social factors, meaning that more prestigious dialects are processed differently than less prestigious dialects (Sumner & Kataoka, 2013). This raises the possibility that the global prestige of the D2 and/or D1 might affect how much that D1/D2 shapes a migrant's cognitive linguistic representations, and ultimately how much their speech perception is affected by the D2 (cf. Walker et al. (2018)).

This paper investigates whether and how long-term exposure in adulthood to a second dialect affects performance in a listening in noise task. In such tasks, participants are played words or sentences mixed with noise, and are asked to report what they hear. Listeners are scored on transcription accuracy. Obviously recognizing words in noise is more difficult than recognizing words in quiet, and it gets harder as the SNR decreases (i.e., Clopper & Bradlow, 2008), and if the competing noise is more similar to the signal (Danahauer & Leppler, 1979; Parikh & Loizou, 2005; Simpson & Cooke, 2005). Like listening to unfamiliar dialects, the difficulties of listening in noise have been attributed to a mismatch between stored phonological representations and the signal, as well as attentional issues (Mattys, Davis, Bradlow, & Scott, 2012). Previous,

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