

What you see is what you hear: Exposure to regionally-meaningful cues affects speech processing under adverse listening conditions

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It is well known that social information can affect speech perception. For example, many studies have shown that manipulating listeners' expectations about accent region (e.g., [4]) or simply exposing them to geographically-meaningful objects (e.g., [3]) can significantly bias phoneme categorization. These findings have been argued to support an exemplar-based model in which non-acoustic information plays an important role in speech perception. However, more recently, a number of studies have failed to find convincing evidence for regional priming effects (e.g., [2]). Several reasons have been suggested for this inconsistency, e.g., the use of synthetic vowel continua and the varying sociolinguistic salience of different phonetic variables (cf. [2]). In this study, we took a different approach to measuring regional priming. Rather than focus on the categorization of synthetic vowel tokens, we investigated how the intelligibility of natural speech (sentences), produced in 2 different accents [SSBE (Standard Southern British English), Glaswegian (GE)] was influenced when the speech was presented with congruent and incongruent visual cues depicting London (SSBE) or Glasgow.

All testing was carried out remotely via Gorilla (gorilla.sc) and Prolific (app.prolific.co). Sixty-two listeners (19 male) aged 18-50yrs transcribed 72 IEEE sentences (36 SSBE, 36 GE) at 3 signal-to-noise ratios (+3 dB, 0 dB, -3 dB), produced by 4 male talkers (2 SSBE, 2 GE). In each accent & noise condition, half the sentences were presented with congruent visual cues and half with incongruent visual cues. Listeners reported differing levels of familiarity with SSBE & GE; 31 listeners were residents of southern England and self-identified as SSBE speakers with no regular exposure to Glaswegian or any other Scottish English accents. The remaining 31 were residents of Scotland and were familiar with both Glaswegian and SSBE.

In general, performance decreased as the noise level increased. GE speakers also performed better than SSBE speakers overall [$t(60)=8.07$, $p < 0.001$]: GE listeners performed equally well with SSBE & GE sentences at each noise level, while SSBE listeners performed more poorly with GE (cf. [1]). Separate repeated measures ANOVA for SSBE & GE listeners demonstrated a significant effect of congruence: listeners from both accent backgrounds (i.e., SSBE & GE) had higher transcription accuracy when the stimuli were accompanied by matching (i.e., congruent) regional cues than when they were presented with mismatching (i.e., incongruent) visual cues [SSBE: $F(1, 30)=165.39$, $p < 0.001$; GE: $F(1,30)=145.89$, $p < 0.001$]. Post-hoc t-tests indicated that this was affected by noise level; congruence only facilitated performance at higher SNRs, 0dB and -3dB. We interpret these results as indicating that exposure to visual cues activated corresponding regional concepts, which interacted with the processing of phonetic variations. Nevertheless, the extent to which regional information is used in speech perception is modulated by the listening conditions. Specifically, when listening conditions deteriorate listeners appear more likely to recruit non-acoustic information and use this to support auditory processing.

References:

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