Perceptual learning of liquids in older listeners

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Numerous studies have shown that young listeners can adapt to idiosyncratic pronunciations through lexically-guided perceptual learning (McQueen et al., 2006; Norris et al., 2003). Aging may affect sensitivity to the higher frequencies in the speech signal, which results in the loss of sensitivity to phonetic detail. Nevertheless, short-term adaptation to accents and to time-compressed speech seems to be preserved with aging and with hearing loss (Adank & Janse, 2010; Gordon-Salant et al., 2010). However, the extent of the flexibility of phoneme categories and the conditions under which these phoneme boundary shifts can or cannot occur in an older population have not been investigated yet.

This research investigates whether older listeners are able to tune into a speaker like young normal-hearing listeners can, by comparing the perceptual learning effect of older listeners (aged 60+, varying in their hearing sensitivity) and young (normal-hearing) listeners. Moreover, we investigate whether hearing loss affects the ability to learn non-standard phoneme pronunciations. Hearing loss may interfere with perceptual learning, as perceptual evidence in favour of a certain pronunciation variant is weaker. We therefore expected the perceptual learning effect of older listeners to be weaker and less stable than for young listeners.

36 young and 60 older listeners were exposed to an ambiguous [$^{l}/_{ɹ}$] in Dutch words ending in either /r/ or /l/ and to Dutch words ending in natural /r/ and /l/, in a lexical decision task (following Norris et al., 2003; Scharenborg et al., 2011). Young listeners gave significantly more correct answers to natural than to ambiguous stimuli ($p<0.001$). Older listeners had fewer correct answers to the natural stimuli ($p<0.05$), but showed relatively less impact of stimulus ambiguity ($p<0.005$). Young listeners gave significantly slower responses to ambiguous than to natural stimuli ($p<0.001$). Older listeners gave slower responses to the natural stimuli than the young listeners ($p<0.05$), but again were less impacted by stimulus ambiguity ($p<0.005$).

In a subsequent phonetic categorisation task, listeners were confronted with a range of ambiguous sounds from the [l]-[ɹ]-continuum. The results revealed that listeners exposed to ambiguous [$^{l}/_{ɹ}$] in /r/-final words gave significantly more /r/-responses than listeners exposed to [$^{l}/_{ɹ}$] in /l/-final words ($p<0.001$; see also Figure 1). This effect was significantly stronger for the young listeners in block 1, but not so in the subsequent blocks. After dividing the older listener group into one better-hearing and one poorer-hearing group, no interaction was found between exposure condition and hearing status, suggesting that the age group difference in the size of the initial learning effect may not be due to hearing status. Contrary to our expectations, the learning effect for the older listeners remained stable over blocks, while the young listeners showed 'unlearning'; i.e., the difference in percentage /r/-responses between the two exposure groups of young listeners grew significantly smaller over blocks.

Concluding, the learning effect is stronger right after exposure for young listeners, while the effect is longer lasting for older listeners. Our results show that older listeners, with and without hearing loss, can still retune their phoneme categories to facilitate word recognition. Hearing loss does not seem to interfere with perceptual learning. Our results are in line with other evidence that the perceptual system remains flexible throughout the lifespan (Adank & Janse, 2010; Golomb et al., 2007; Peelle & Wingfield, 2005).

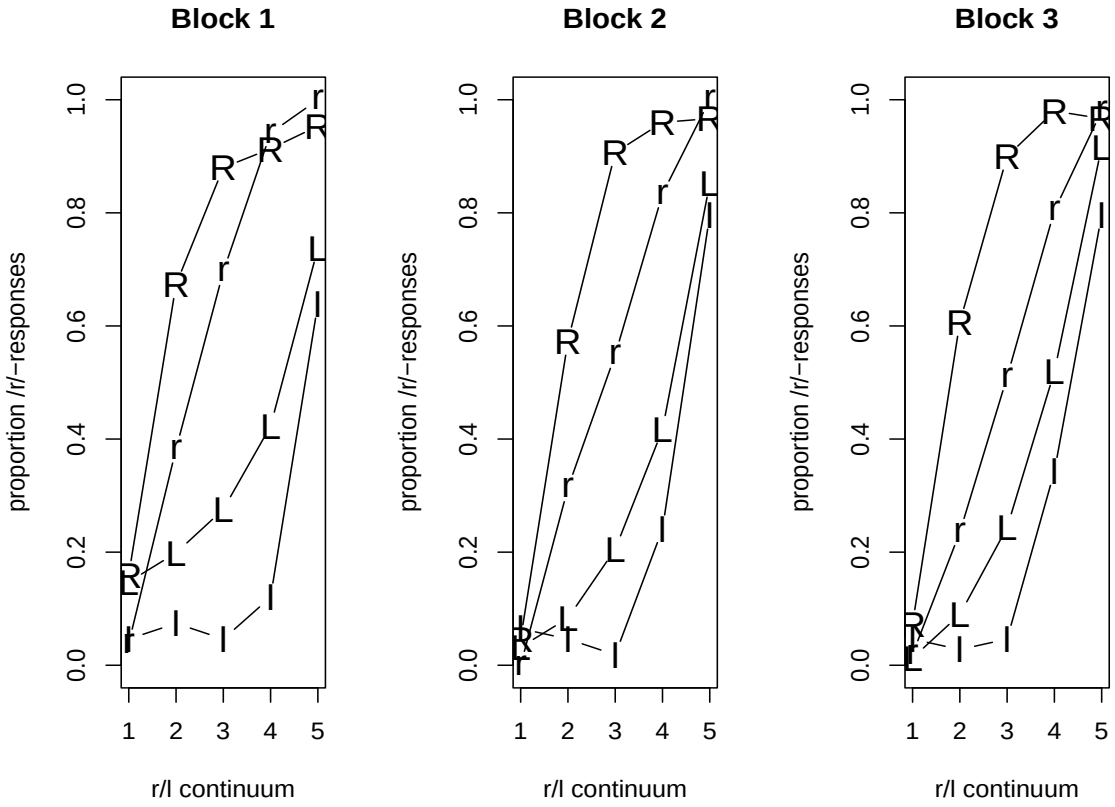

Figure 1. The total proportion of /r/ responses for the two exposure conditions: r and R indicate the groups of young and older listeners, respectively, who learned to map [ɹ/ɹ] onto [ɹ]. l and L indicate the groups of young and older listeners, respectively, who learned to map [ɹ/ɹ] onto [l] for the five ambiguous test stimuli, over the three test blocks. Block 1: test items 1-30; Block 2: test items 31-60; Block 3: test items 61-90.

References

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