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Speech perception in dyslexia: Auditory, phonetic, and phonological context effects

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A number of studies reported less categorical speech perception by dyslexics than in normal-reading controls: That is, in a two-alternative forced choice task (2AFC) with stimuli varying in one acoustic parameter (e.g., formant onset frequency), dyslexics show a less steep identification function than normal-reading children. This 'categorical-perception deficit' has been explained as either a general-perceptual deficit or a speech-specific, phonological deficit. A number of recent studies rendered it unlikely that dyslexia is associated with a general perceptual deficit. It remains unclear, however, how a speech-specific, phonological deficit could account for the categorical-perception deficit.

Using a mathematical model, we showed that the categorical-perception deficit would be an emergent property of poor context-sensitivity in speech perception. Therefore, we tested whether dyslexics show less context sensitivity in speech perception, using acoustic, phonetic, and phonological context cues. Acoustic context effects were measured as the influence of a preceding sine-wave on the perception of a velar-alveolar stop continuum (cf. Lotto and Kluender, 1998, expt. 4). Phonetic context effects were measured as the influence of a preceding vowel-liquid syllable (/al/ and /ar/) on the perception of the same velar-alveolar stop continuum (cf. Fowler, Brown, & Mann, 2000, expt. 3a). Phonological context effects were measured by testing participants' perception of phonologically valid changes (*garden bench* → *gardem bench*, which occurs in natural speech due to place assimilation) and phonologically invalid changes (*garden chair* → *gardem chair*, which does not occur in natural speech). Adults show a context effect by hearing the canonical pronunciation *garden* in *gardem bench* but not in *gardem chair*. In contrast with our initial hypothesis, the results revealed that dyslexics did not show less context sensitivity than their normal-reading peers. The context sensitivity to acoustic and phonological cues was of similar size in both groups. Dyslexics were, however, more influenced by a phonetic context cue than their normal-reading peers. This is in line with the assumption that dyslexics have a less segmentally organised lexicon than their normal-reading peers. In addition, the dyslexic group did not show any evidence of a speech-perception deficit in any of the three experiments. These results provide no evidence for the assumption of a general auditory deficit in dyslexia.

Lotto, A.J., and Kluender, K.R. (1998) General contrast effects in speech perception: Effect of preceding liquid on stop consonant identification. *Perception and Psychophysics* 60, 602-619.

Fowler, C.A., Brown, J.M., and Mann, V.A. (2000) Contrast effects do not underlie effects of preceding liquids on stop-consonant identification by humans. *Journal of Experimental Psychology: Human Perception and Performance* 26, 877-888.