The dynamics of recognizing words in people with language and hearing impairments: Revealing mechanisms of disordered language; pushing the boundaries of basic theory.

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Many (if not most) papers on language acquisition and processing start by stating the complexity of the problem faced by the learner or language users. Such problems include classic problems like the problem of recognizing speech despite acoustic variability (Perkell & Klatt, 1986), the problem of constructing a syntactic parse despite attachment ambiguities (Frazier & Rayner, 1982), or the problem of learning a word in the face of massive referential ambiguity (Quine, 1960). Our papers then go on to argue that despite this challenge most people seem to solve this problem nearly effortlessly. However, there is increasing appreciation for the fact that this framing is wrong. Roughly 12% of children can be diagnosed with Developmental Language Disorders or DLD (what used to be known as specific language impairment) (Tomblin et al., 1997); 12% may have dyslexia (about half of which will also have DLD) (Pennington & Bishop, 2009). Moreover, 60% of children are below proficient in reading (NCES, 2013). And over 60% of people will struggle with hearing loss at some point in their life (Lin, Niparko, & Ferrucci, 2011). The normative case of language processing and development is hard to find. This prompts a rethinking of the basic framing of psycholinguistics and its relationship to individual variation, development and disorders.

In this talk I present a series of studies using spoken word recognition as a lens in which to understand these issues. In typical adults, spoken word recognition is extremely well characterized psycholinguistically and there is a consensus over the underlying computational processes (Marslen-Wilson, 1987; McClelland & Elman, 1986). From the earliest moments of a word (e.g., *wi…*), people partially activate a range of potential matches *(wizard, whistle, window*) which compete dynamically until a word is recognized (the winner). This process can be characterized with great precision by techniques like the visual world paradigm (Allopenna, Magnuson, & Tanenhaus, 1998) and we have strong computational models which can explain the fundamental mechanisms (Hannagan, Magnuson, & Grainger, 2013; Norris & McQueen, 2008).

Building on this basis, I present a series of case studies that suggest ways in which the basic and applied language sciences can fruitfully inform each other. First, I present work on real-time word recognition in children with DLD. This has allowed us to characterize their disorders in terms of fundamental differences computational mechanisms of processing: lateral inhibition among words. This mechanistic framing may offer better avenues for diagnosis and treatment of DLD than more descriptive deficit models. Second, I present results from a series of control studies on typical adolescents. They show developmental differences in real-time processing that are distinct from what is observed in DLD. However, crucially, they also show surprisingly late development of basic speech perception and word recognition skills (all the way through adolescence). This age range would not have been studied without the motivation of understanding impairment and highlights a whole new set of basic science questions. It suggests the value of examining variation more fully for raising new questions for basic science. Finally, I present work on prelingually deaf cochlear implant users. In contrast to all models of spoken word recognition, they do not appear to process words immediately; this prompts us to think in new ways about the underlying dimensionality of theories of basic processing.

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