Children with speech sound disorders (SSD) have difficulty producing, using, and integrating the sounds of their target language system. In addition, some children with SSD struggle to correctly perceive and categorize speech sounds into separate sound categories, suggesting that their auditory sensory responses may also be impaired. While children with SSD are traditionally thought to be unable to detect subtle differences between sounds, there is little or no understanding of the underlying perceptual mechanisms implicated in SSD. My broad research program addresses the issue of how to most efficiently and effectively treat children with SSD. I propose that children with SSD may have difficulty creating mental phonological (sound) representations due to their inaccurate perception of speech sounds, which then directly affects their ability to produce speech sounds correctly.

This important clinical problem is addressed using multiple methodological techniques. First, the auditory sensory responses of children with SSD and their age-matched typically developing (TD) peers are examined using electrophysiological measures (event-related potentials, ERPs). Children with SSD were found to demonstrate less mature neural response patterns to sounds that they could and could not produce correctly, suggesting less detailed phonological representations. Next, the underlying neural mechanisms associated with the encoding of speech sounds prior to word production are examined. It was observed that some sounds require more neural resources for accurate production, providing the first neural evidence of sound complexity. In addition, children with SSD demonstrated more extensive neural recruitment than did their TD peers during word production, indicative of less efficient phonological encoding abilities. Next, the inaccurate speech production patterns of children with SSD are addressed using a traditional speech treatment approach. Specifically, unfamiliar words are used in treatment so that children can focus on the sound structure of the words. The use of these words has resulted in greater intervention gains as compared to more familiar words. Finally, neural changes that occur in conjunction with speech treatment are investigated. Children’s responses to sounds targeted in treatment exhibited maturational changes represented by more specific and consistent neuronal activation. Suggestions for further treatment modifications will be proposed.

Together these studies contribute to the current understanding of developmental speech sound disorders. The neural response patterns of children with SSD are different from their TD peers. This suggests that their mental representations of speech sounds are atypical, which in turn negatively impacts children’s ability to correctly produce words. In order to best treat this common developmental disorder, intervention must be multidimensional and target both speech perception and production.