Training With Temporally Modified Speech Results In Dramatic Improvements In Speech Perception And Language Comprehension

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Tallal & colleagues have shown that children with developmental language-based learning disabilities (LLD) require significantly longer intervals between two or more sensory events to discriminate or sequence them accurately. Further, they have shown that these children fail to discriminate between speech syllables that incorporate brief or rapidly changing acoustic cues that are followed in rapid succession by other acoustic cues (such as the formant transitions in stop-consonants). However, significant improvement in syllable discrimination was found when the duration of the formant transitions within stop-consonant syllables were computer extended from 40 to 80 ms.

We have now utilized these findings to develop a computer algorithm that both extends in time and enhances in amplitude the brief, rapidly changing portions of speech within ongoing, fluent speech (see poster by Nagarajan et al.).

This algorithm was applied to speech perception and language comprehension training materials. Seven SLI children participated in a series of speech training experiments in which they listened to temporally modified speech a minimum of 2 hours per day, 5 days a week for 1 month. Highly significant, indeed dramatic, improvements in speech perception and language comprehension were found between pre- and post-test measures.

These findings support the hypothesis that LLD can result from a more basic temporal integration deficit which disrupts the ability to perceive, and thus provide an adequate neural representation for, speech syllables which are characterized by brief, rapidly changing acoustic spectra. Furthermore, these studies demonstrate for the first time that dramatic improvement in speech perception and language comprehension can be achieved by training with temporally modified speech.