Altmann, L.

Wiseheart R, Altmann LJ, Park H, Lombardino LJ. Sentence comprehension in young adults with developmental dyslexia. Ann Dyslexia. 2009 Dec;59(2):151-67. This study investigated the effects of syntactic complexity on written sentence comprehension in compensated adults with dyslexia. Because working memory (WM) plays a key role in processing complex sentences, and individuals with dyslexia often demonstrate persistent deficits in WM, we hypothesized that individuals with dyslexia would perform more poorly on tasks designed to assess the comprehension of syntactic structures that are especially taxing on WM (e.g., passives, sentences with relative clauses). Compared to their nondyslexic peers, individuals with dyslexia were significantly less accurate and marginally slower on passive sentences. For sentences containing relative clauses, the dyslexic group was also less accurate but did not differ in response times. Covarying WM and word reading in both analyses eliminated group differences showing that syntactic deficits in adults with dyslexia are constrained by both WM and word-reading ability. These findings support previous research showing that syntactic processing deficits are characteristic of dyslexia, even among high-achieving students.

Edmonds, L.

Edmonds LA, Nadeau SE, Kiran S. Effect of Verb Network Strengthening Treatment (VNeST) on Lexical Retrieval of Content Words in Sentences in Persons with Aphasia. Aphasiology. 2009 Mar 1;23(3):402-424. BACKGROUND: Verb Network Strengthening Treatment (VNeST) is a semantic treatment that aims to improve lexical retrieval of content words in sentence context by promoting systematic retrieval of verbs (e.g., measure) and their thematic roles (i.e., agent (doer of the action, e.g., carpenter, chef)) and patient (receiver of the action, e.g., lumber, sugar)). VNeST is influenced by Loverso and colleagues (e.g., Loverso, Selinger, and Prescott, 1979), who used "verb as core" treatment to improve sentence production with encouraging results, and McRae and colleagues, who showed that verbs prime typical agents (e.g., pray-nun) and patients (arrest-criminal) (Ferretti, McRae, & Hatherell, 2001) and vice-versa (McRae, Hare, Elman, & Ferretti, 2005). AIMS: There are four specific questions in this study. Does training a set of verbs using VNeST generalize to the ability to produce 1) an agent (carpenter), trained verb (measure), and patient (stairs) in response to novel picture stimuli and 2) an agent (nurse), untrained semantically related verb (weigh), and patient (baby) in response to novel picture stimuli? 3) Are generalization effects maintained?, and 4) Does VNeST generalize to the ability to retrieve nouns and verbs not directly related to treatment items in single word naming, picture description and connected speech tasks? METHODS PROCEDURES: Four participants with aphasia participated. Participants received VNeST, which involves retrieval of agent-patient pairs (e.g., chef/sugar, surveyor/land) related to trained verbs (e.g., measure), two times per week. A single subject, repeated probe, multiple baseline experimental design was used. Generalization to sentence production for sentences containing trained verbs and untrained semantically related verbs was tested weekly. OUTCOMES RESULTS: Results demonstrated
generalization to lexical retrieval of content words in sentences with trained and untrained verbs across participants. Additionally, pre- to post-treatment generalization was observed on single verb and noun naming and lexical retrieval in sentences across a variety of tasks across participants. Generalization to connected speech was observed for 3 of 4 participants. CONCLUSIONS: Though preliminary, these results indicate that VNeST may be effective in promoting generalization from single word naming to connected speech in persons with moderate aphasia. A number of clinical implications related to treatment efficiency are discussed.

Hall, James W.

Johnston KN, John AB, Kreisman NV, Hall JW 3rd, Crandell CC. Multiple benefits of personal FM system use by children with auditory processing disorder (APD). Int J Audiol. 2009;48(6):371-83. Children with auditory processing disorders (APD) were fitted with Phonak EduLink FM devices for home and classroom use. Baseline measures of the children with APD, prior to FM use, documented significantly lower speech-perception scores, evidence of decreased academic performance, and psychosocial problems in comparison to an age- and gender-matched control group. Repeated measures during the school year demonstrated speech-perception improvement in noisy classroom environments as well as significant academic and psychosocial benefits. Compared with the control group, the children with APD showed greater speech-perception advantage with FM technology. Notably, after prolonged FM use, even unaided (no FM device) speech-perception performance was improved in the children with APD, suggesting the possibility of fundamentally enhanced auditory system function.

van Zyl A, Swanepoel D, Hall JW 3rd. Effect of prolonged contralateral acoustic stimulation on transient evoked otoacoustic emissions. Hear Res. 2009 Aug;254(1-2):77-81. Although the suppressive effect of the medial olivocochlear system (MOCS) on peripheral auditory active mechanisms is well documented in humans, the effect of efferent inhibition over prolonged periods of acoustic stimulation is less well documented, especially as observed by transient evoked otoacoustic emission (TEOAE) suppression. The present study evaluated the relationship between the duration of contralateral acoustic stimulation and the suppression of TEOAE in 10 normal-hearing adults. TEOAE recordings with linear clicks (60 dB SPL) were measured at four intervals during 15 min of continuous contralateral white noise (45 dB SL), followed by two post-noise recordings. An identical within-subject control condition was recorded without contralateral noise. Experimental and control measurements were repeated three times, on separate days. Results revealed significant and sustained TEOAE amplitude reduction for the entire duration of contralateral stimulation. Suppression increased gradually for the duration of contralateral noise presented, but not sufficiently to be statistically significant. Three minutes after noise termination, TEOAE amplitudes increased to values significantly above control recordings. The MOCS is able to sustain suppression over a prolonged duration of contralateral stimulation, supporting its role as an active modulator of outer hair cell mechanics during ongoing stimuli.

OBJECTIVE/HYPOTHESIS: To specify a set of acoustic cues for vocal aging and to establish their perceptual relevance. STUDY DESIGN: Perceptual testing. METHODS: To identify the acoustic and perceptual correlates of the aging voice, voice quality [in conjunction with speaking rate and fundamental frequency (F(0))] was systematically manipulated using resynthesis to determine its effect on perceived age. Ten young male voices were resynthesized using two levels of noise (random modulation of F(0) contour) and two levels of tremor (constant modulation of F(0) contour with a low-amplitude wave) under a speaking-rate manipulation (an increase in speaking rate that is common to older male voices). These materials were submitted to 40 naive listeners in an age-estimation task. Two sets of comparison materials were also included for evaluation: unmanipulated samples from a 150 voice database of young, middle-aged, and older voices and disordered voice samples representing natural manifestations of the voice qualities of interest. RESULTS: Speaking rate, highest degree of tremor, and highest degree of noise all shifted, in an additive manner, the mean perceived age of the young male voices by a maximum of 12 years on average; individual voices were observed being shifted by a generation. Fundamental frequency manipulations had no significant effect on perceived age. CONCLUSIONS: Voice quality (both tremor and noise) and speaking rate are all perceptually relevant cues of age in male voices.

Hollien H, Harnsberger JD, Martin CA, Hill R, Alderman GA. Perceiving the effects of ethanol intoxication on voice. J Voice. 2009 Sep;23(5):552-9. Many conditions operate to degrade the quality of the human voice. Alcohol intoxication is one of them. In this project, the objectives were to examine the ability of human listeners to accurately estimate both the presence and severity of intoxication from two types of speech samples. A review of available data suggests that, although listeners can often identify individuals who are intoxicated simply by hearing samples of their voice, they are less efficient at accurately determining the severity of this condition. A number of aural-perceptual studies were carried out to test these relationships. Populations of speakers, selected based on rigorous criteria, provided orally read and extemporaneous utterances when sober and at three highly controlled levels of intoxication. Listener groups of university students and professionals attempted to identify both the existence and specific level of intoxication present. It was found that these individuals were proficient in recognizing the presence of, and increases in, intoxication but were less accurate in gauging the specific levels. Several subordinate relationships were also investigated. In this regard, statistically significant differences were not found between male and female listeners or between professionals and lay listeners; however, they were found for different classes of speech. That is, it was shown that text difficulty correlated with severity of effect.

Harnsberger JD, Hollien H, Martin CA, Hollien KA. Stress and deception in speech: evaluating layered voice analysis. J Forensic Sci. 2009 May;54(3):642-50. This study was
designed to evaluate commonly used voice stress analyzers—in this case the layered voice analysis (LVA) system. The research protocol involved the use of a speech database containing materials recorded while highly controlled deception and stress levels were systematically varied. Subjects were 24 each males/females (age range 18-63 years) drawn from a diverse population. All held strong views about some issue; they were required to make intense contradictory statements while believing that they would be heard/seen by peers. The LVA system was then evaluated by means of a double blind study using two types of examiners: a pair of scientists trained and certified by the manufacturer in the proper use of the system and two highly experienced LVA instructors provided by this same firm. The results showed that the "true positive" (or hit) rates for all examiners averaged near chance (42-56%) for all conditions, types of materials (e.g., stress vs. unstressed, truth vs. deception), and examiners (scientists vs. manufacturers). Most importantly, the false positive rate was very high, ranging from 40% to 65%. Sensitivity statistics confirmed that the LVA system operated at about chance levels in the detection of truth, deception, and the presence of high and low vocal stress states.

Le Prell, C.

Bledsoe SC Jr, Koehler S, Tucci DL, Zhou J, Le Prell C, Shore SE. Ventral cochlear nucleus responses to contralateral sound are mediated by commissural and olivocochlear pathways. J Neurophysiol. 2009 Aug;102(2):886-900. In the normal guinea pig, contralateral sound inhibits more than a third of ventral cochlear nucleus (VCN) neurons but excites <4% of these neurons. However, unilateral conductive hearing loss (CHL) and cochlear ablation (CA) result in a major enhancement of contralateral excitation. The response properties of the contralateral excitation produced by CHL and CA are similar, suggesting similar pathways are involved for both types of hearing loss. Here we used the neurotoxin melittin to test the hypothesis that this "compensatory" contralateral excitation is mediated either by direct glutamatergic CN-commissural projections or by cholinergic neurons of the olivocochlear bundle (OCB) that send collaterals to the VCN. Unit responses were recorded from the left VCN of anesthetized, unilaterally deafened guinea pigs (CHL via ossicular disruption, or CA via mechanical destruction). Neural responses were obtained with 16-channel electrodes to enable simultaneous data collection from a large number of single- and multiunits in response to ipsi- and contralateral tone burst and noise stimuli. Lesions of each pathway had differential effects on the contralateral excitation. We conclude that contralateral excitation has a fast and a slow component. The fast excitation is likely mediated by glutamatergic neurons located in medial regions of VCN that send their commissural axons to the other CN via the dorsal/intermediate acoustic striae. The slow component is likely mediated by the OCB collateral projections to the CN. Commissural neurons that leave the CN via the trapezoid body are an additional source of fast, contralateral excitation.
Wayland RP, Eckhouse E, Lombardino L, Roberts R. Speech Perception Among School-Aged Skilled and Less Skilled Readers. J Psycholinguist Res. 2009 Dec 24. [Epub ahead of print]. This study investigated the relationship between speech perception, phonological processing and reading skills among school-aged children classified as 'skilled' and 'less skilled' readers based on their ability to read words, decode non-words, and comprehend short passages. Three speech perception tasks involving categorization of speech continua differing in voicing, place and manner of articulation were administered and compared to phonological processing skills in phonological awareness, speeded naming and verbal short-term memory. The results obtained suggested that (a) speech categorization among skilled readers differed from that of less skilled readers, (b) speech perception skills were associated with both reading and phonological processing skills among both skilled and less skilled readers, however, (c) a strong association between speeded naming and both word and passage reading skills found among skilled readers was absent among less skilled readers. These results suggested that phonological representations and/or activation may not be as well developed in less skilled readers.

Wiseheart R, Altmann LJ, Park H, Lombardino LJ. Sentence comprehension in young adults with developmental dyslexia. Ann Dyslexia. 2009 Dec;59(2):151-67. This study investigated the effects of syntactic complexity on written sentence comprehension in compensated adults with dyslexia. Because working memory (WM) plays a key role in processing complex sentences, and individuals with dyslexia often demonstrate persistent deficits in WM, we hypothesized that individuals with dyslexia would perform more poorly on tasks designed to assess the comprehension of syntactic structures that are especially taxing on WM (e.g., passives, sentences with relative clauses). Compared to their nondyslexic peers, individuals with dyslexia were significantly less accurate and marginally slower on passive sentences. For sentences containing relative clauses, the dyslexic group was also less accurate but did not differ in response times. Covarying WM and word reading in both analyses eliminated group differences showing that syntactic deficits in adults with dyslexia are constrained by both WM and word-reading ability. These findings support previous research showing that syntactic processing deficits are characteristic of dyslexia, even among high-achieving students.

Rahul Shrivastav

Shrivastav R, Camacho A. A Computational Model to Predict Changes in Breathiness Resulting From Variations in Aspiration Noise Level. J Voice. 2009 Nov 6. [Epub ahead of print]. Perception of breathy voice quality is cued by a number of acoustic changes including an increase in aspiration noise level (AH) and spectral slope. Changes in AH in a vowel may be
evaluated through measures such as the harmonic-to-noise ratio, cepstral peak prominence (CPP), or via auditory measures such as the partial loudness of harmonic energy and loudness of aspiration noise. Although a number of experiments have reported high correlation between such measures and ratings of perceived breathiness, a formal model to predict breathiness of a vowel has not been proposed. This research describes two computational models to predict changes in breathiness resulting from variations in AH. One model uses auditory measures, whereas the other uses CPP as independent variables to predict breathiness. For both cases, a translated and truncated power function is required to predict breathiness. Some parameters in both of these models were observed to be pitch dependent. The "unified" model based on auditory measures was observed to be more accurate than one based on CPP.


OBJECTIVE/HYPOTHESIS: To specify a set of acoustic cues for vocal aging and to establish their perceptual relevance. STUDY DESIGN: Perceptual testing. METHODS: To identify the acoustic and perceptual correlates of the aging voice, voice quality [in conjunction with speaking rate and fundamental frequency (F(0))] was systematically manipulated using resynthesis to determine its effect on perceived age. Ten young male voices were resynthesized using two levels of noise (random modulation of F(0) contour) and two levels of tremor (constant modulation of F(0) contour with a low-amplitude wave) under a speaking-rate manipulation (an increase in speaking rate that is common to older male voices). These materials were submitted to 40 naive listeners in an age-estimation task. Two sets of comparison materials were also included for evaluation: unmanipulated samples from a 150 voice database of young, middle-aged, and older voices and disordered voice samples representing natural manifestations of the voice qualities of interest. RESULTS: Speaking rate, highest degree of tremor, and highest degree of noise all shifted, in an additive manner, the mean perceived age of the young male voices by a maximum of 12 years on average; individual voices were observed being shifted by a generation. Fundamental frequency manipulations had no significant effect on perceived age. CONCLUSIONS: Voice quality (both tremor and noise) and speaking rate are all perceptually relevant cues of age in male voices.


Experiments to study voice quality have typically used rating scales or direct magnitude estimation to obtain listener judgments. Unfortunately, the data obtained using these tasks are context dependent, which makes it difficult to compare perceptual judgments of voice quality across experiments. The present experiment describes a simple matching task to quantify voice quality. The data obtained through this task were compared to perceptual judgments obtained using rating scale and direct magnitude estimation tasks to determine whether the three tasks provide equivalent perceptual distances across stimuli. Ten synthetic vowel continua that varied in terms of their aspiration noise were evaluated for breathiness using each of the three tasks. Linear and nonlinear regressions were used to compare the perceptual distances between stimuli obtained through each technique. Results show that the perceptual distances estimated from matching and direct magnitude estimation task are similar, but both differ from the rating scale task, suggesting that the matching task provides perceptual distances with ratio-level measurement properties. The matching task is advantageous for measurement of vocal quality
because it provides reliable measurement with ratio-level scale properties. It allows the use of a fixed reference signal for all comparisons, thus allowing researchers to directly compare findings across different experiments.