

Predicting Phonetic Accuracy in Children with and without Phonological Disorder

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A recent project in our lab examined group differences between children with typical phonological development (TD) and children with phonological disorder (PD, i.e., extremely inaccurate speech production in the absence of a clear predisposing condition) on a set of three experiments designed to determine the locus of impairment in PD (Munson et al., 2006). These were (a) a delayed naming experiment (modeled after Lahey & Edwards, 1996), designed to examine lexical access, (b) a cross-modal picture-word interference task (modeled after Brooks & MacWhinney, 2000), designed to examine phonological encoding, and (c) an implicit phonological learning task (modeled after Fisher et al., 2001), designed to examine perceptual learning. Munson et al. (2006) found the largest and most consistent group in the perceptual-learning task. This finding supports a model of PD in which these children's speech-production inaccuracy is the consequence of deficits in building robust perceptual representations for speech sounds. This presentation inverts this question, and asks whether performance on the experimental tasks described by Munson et al. (2006) predicts a significant, unique proportion of variance in children's phonetic accuracy (PA) beyond what is predicted by the existing measures that have been used to classify children as PD. This was examined with a series of multiple regressions, the dependent measure in which was a measure of children's PA derived from their performance on the Goldman-Fristoe Test of Articulation-2 (GFTA-2, Goldman & Fristoe, 2000). Percentage of phonemes correctly produced (PPC) were calculated based on phonetic transcriptions of the words on this test. Two sets of predictor variables were used. The first set was labeled 'existing' measures, as it included both existing standardized tests, and nonstandardized measures that have been used in previous research. This set included two measures of vocabulary size (standard scores on the Peabody Picture Vocabulary Test-III [PPVT-III, Dunn & Dunn, 1997] and the Expressive Vocabulary Test [EVT, Williams, 1997]), a measure of speech perception (percentage correct performance on a minimal-pair identification task), and a measure of speech motor control (average diadochokinetic rate for the sequences /pʌ/, /tʌ/, /kʌ/ and /pʌtʌkʌ/). The second 'experimental' set included summary measures from the experimental tasks described in Munson et al. (2006). These included a measure of children's naming speed and an estimate of lexical access speed which were taken from the delayed naming experiment, a measure phonological encoding speed taken from the cross-modal picture-naming task, and a measure of priming magnitude taken from the implicit phonological learning task. Two regressions were completed. In both, age was forced as the first variable. It accounted for 20% of the variance in PPC scores. In the first regression, the 'existing' measures were entered in the regression equation first, in a block, in a stepwise fashion. This was followed by a block of all of the 'experimental' measures, which were also entered stepwise. In this regression, EVT standard scores accounted for 23% of the variance in PPC scores, followed by minimal-pair identification accuracy, which accounted for 9% of the variance. In the second block, naming speed accounted for an additional 12% of the variance in PPC. The second regression entered all existing and experimental measures in a single block, again in a stepwise fashion. Here, naming speed accounted for 30% of the variance in PPC scores, 16% were accounted for by PPVT-III scores, and 6% were accounted for by a measure of priming magnitude. These regressions were qualitatively similar: both found that a combination of a static measure of vocabulary size (either PPVT-III or EVT scores), a measure of naming speed, and a measure of perceptual ability (either minimal-pair identification or priming magnitude) accounted for significant, unique variance in PPC scores, even when age was accounted for statistically. The finding that perceptual measures predict a significant, unique proportion of variance in PA is consistent with Munson et al.'s conclusion that perceptual abilities play a primary role in determining PA. The strong, significant predictive value of measures of vocabulary size is consistent with Beckman and Edwards' (2000) and Pierrehumbert's (2003) conjectures that phonological development is driven by lexical growth and elaboration. The predictive value of the naming-speed measure was somewhat surprising, and may indicate that PA is facilitated by rapid access of words from the mental lexicon, a finding that has not been reported previously.

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