



Relationships Among Clinical Experience, Practice Patterns, and the Perception of Children's Speech Errors

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Introduction

- Accurate speech perception is at the core of an accurate and valid assessment of children's speech production. Children's speech contains considerable within-category variation. Normal speech sound development often does not proceed categorically: children *gradually* differentiate between target sounds and their errors during development. Continuous rating scales can be used to measure this gradual differentiation (Munson, Schellinger, & Urberg-Carlson, 2012; Urberg-Carlson & Munson, 2013)
- Munson, Johnson, and Edwards (2012) and Diamond and Munson (2013, this conference) showed that clinically trained listeners were superior to untrained ones in perceiving within-category detail in children's speech in quiet and in background noise.
- Both of those studies examined a relatively small (n=30) group of clinicians. To expand these findings, we conducted a nationwide survey that included both a speech-perception component and a questionnaire about practice patterns.

Research Objectives

- To document clinical practice patterns regarding phonetic transcription and other perceptual assessments of children's speech.
- To compare the performance of laypeople and clinicians on an Web-based experiment examining the perception of children's speech
- To examine relationships between practice patterns and speech perception.

Methods

Participants

- Clinicians (N=81) were recruited by email through speech-language-hearing state association listservs, social networking websites, and by word-of-mouth from colleagues and other participants.
- Laypeople (N=20) were recruited through social media and through word-of-mouth.

Speech Perception Experiment

- The stimuli were children's productions of sound from four contrasts: /t/-/k/, /d/-/g/, /s/-/ʃ/, and /s/-/θ/. These contrasts were chosen because they are commonly neutralized by children during normal phonological development.
- The productions were taken from the παιδολογος (paidologos) database of children's speech. Monolingual English-speaking 2-through-5 year-old children were recorded during a picture prompted real word and non-word repetition task. Acoustic analysis and the results of previous perception experiments (Munson et al., 2012) showed the 15 stimuli in each set form a natural continuum between the endpoint sounds.
- The recordings were shortened to include only the initial consonant-vowel sequence (Boersma & Weenink, 2005). This ensured that listeners would not be lexically biased when judging consonant accuracy.
- Listeners judged the stimuli on a nine-point scale (Figure 1) after listening to it no more than twice. A pilot test with two groups of clinically untrained listeners found no significant differences between performance in the laboratory or in uncontrolled listening environments (Munson, 2013)



Figure 1. Sample screen for written survey

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Children with speech disorders are poor learners	1	2	3	4	5
Most children with SLDs will have serious problems in school	1	2	3	4	5
Children with speech sound disorders have trouble making friends and making friends stay in school	1	2	3	4	5
Children with speech disorders are poor learners	1	2	3	4	5
Most children with SLDs will have future problems in school	1	2	3	4	5
Children with speech sound disorders have trouble making friends and making friends stay in school	1	2	3	4	5
Children with speech problems have slow development	1	2	3	4	5
Children with speech disorders often understand language as well as their peers	1	2	3	4	5
Children with speech sound disorders have trouble making friends and making friends stay in school	1	2	3	4	5
Children with speech sound disorders have trouble making friends and making friends stay in school	1	2	3	4	5
Children with speech disorders are worse than their peers at understanding them	1	2	3	4	5

Table 1. Percentage responses for questions on the survey by the more (>10 years) and less (1-10 years) experienced listeners. Questions groupings are based on a factor analysis of all 81 respondents. Significant differences between questions are noted

Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Children with speech disorders are poor learners	12	32	12	27	17
Most children with SLDs will have serious problems in school	13	24	17	24	17
Children with speech sound disorders have trouble making friends and making friends stay in school	9	29	23	23	13
Children with speech disorders are poor learners	9	29	23	23	13
Most children with SLDs will have future problems in school	9	29	23	23	13
Children with speech sound disorders have trouble making friends and making friends stay in school	17	34	14	17	18
Children with speech problems have slow development	16	34	20	17	13
Children with speech disorders often understand language as well as their peers	34	34	20	7	5
Children with speech sound disorders have trouble making friends and making friends stay in school	17	34	14	17	18
Children with speech sound disorders have trouble making friends and making friends stay in school	9	29	23	23	13
Children with speech disorders are worse than their peers at understanding them	12	32	12	27	17

Table 2. Percentage responses for questions on the survey by the inexperienced listeners.



Figure 2. Introduction screen to the audio survey

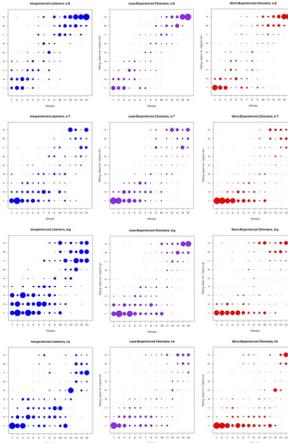


Figure 3. Responses on the audio survey for by the inexperienced listeners, the less-experienced clinicians, and the more-experienced clinicians, separated by contrast type.

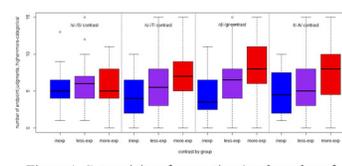


Figure 4. Categoricity of perception (total number of endpoint responses) by the inexperienced listeners, the less-experienced clinicians, and the more-experienced clinicians, separated by contrast type.

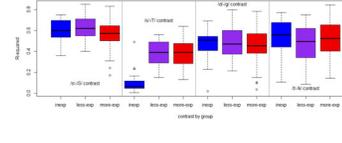


Figure 5. Perceptual acuity (R^2 in regressions predicting ratings from acoustic measures [s/-/ʃ/, /s/-/θ/], or baseline perceptual ratings [t/-/k/, /d/-/g/]) by the inexperienced listeners, the less-experienced clinicians, and the more-experienced clinicians, separated by contrast type.

Questions	Categoricity of response						R^2
	t/k	d/g	s/ʃ	s/θ	t/k	d/g	
Most SLDs of unspecified origin are caused by improper motor learning/planning of speech sounds	0.03	0.03	-0.17	0.11	-0.27		
Most SLDs are related to a language problem	-0.17	-0.29	-0.10	0.27	-0.05		
Children with SLDs are more likely to have comorbid disorders	0.27	0.27	0.10	-0.29	-0.07		
Most children with SLDs are modified self-systems as compared to their peers	-0.13	-0.32	-0.28	0.28	-0.09		
Phonetic transcription must be used for assessment of SLDs	-0.17	-0.27	-0.03	0.09	-0.13		
Corrected scores are the most useful tool for tracking progress of speech sounds during the course of treatment	-0.14	0.20	0.01	0.07	-0.10		
My own observations are the most useful tool for tracking progress of speech sounds during the course of treatment	0.27	0.37	-0.03	-0.27	0.27		

Table 3. Correlations between survey items and selected speech perception measures. Only those measures for which significant correlations were found are included.

Survey

- The survey comprised two sections: demographic questions, and questions about attitudes and practice patterns.
- A focus group with six local experienced speech-language pathologists was conducted to develop the questions about attitudes and practice patterns (Table 1).
- Questions were answered on a six-point equally appearing interval scale (Figure 1)
- To keep the protocol similar across the two groups, a different survey was developed for laypeople (Table 2)

Analysis

- The 81 clinicians were divided into two groups, less-experienced clinicians (n=39, 1-10 years of experience), and more-experienced clinicians (n=42, 10-20+ years of experience).
- Factor analysis (principal components extraction, varimax rotation) was applied to their survey data. The responses to their questions are shown in Table 1, grouped into factors and separated by experience.
- For each set of speech-perception stimuli, two measures were calculated: the percent of endpoint responses (an indication of the extent to which individuals used the entire scale, Figure 4), and the R^2 from regressions predicting individuals' ratings from either the acoustic characteristics of the stimuli [s/-/ʃ/, /s/-/θ/], or baseline perceptual ratings [t/-/k/, /d/-/g/]. This is a measure of perceptual acuity (Figure 5).
- These measures were correlated with items from the survey (Table 3)

Results

- Higher levels of clinical experience were associated with greater use of the endpoints of the survey. This suggests that more-experienced listeners are not discerning or noting differences between acoustically distinct productions that are not clear exemplars of the endpoint sounds. This finding contrasts with previous work (Munson et al., 2012; Diamond & Munson, 2013)
- Higher levels of clinical experience were associated with greater acuity in perceiving /s/-/θ/, which laypeople perceived very poorly.
- Few correlations were found between responses on the survey and speech perception measures. The most consistent relationship was found with whether the clinicians felt that their individualized systems were the superior method for noting progress. Those individuals were more categorical in their perception, and had superior perception of the /s/-/ʃ/ contrast (though poorer perception of /t/-/k/).
- In short, the results of this survey reinforce the finding that clinical training is associated with superior speech perception for some measures. They also show that there is wide variation in speech perception and in practice patterns among speech-language pathologists.

Acknowledgments

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