Speech Ratings by Speech Clinicians Parents and Children

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Ratings of speech samples of children with cleft palate were obtained from speech clinicians in a Cleft Palate Clinic, speech clinicians in the public schools, parents of children with clefts, parents of children without clefts, children with clefts and children without clefts. Analyses of the obtained ratings suggest that nasality and articulation ratings obtained from adult groups do not differ appreciably. Correlations between ratings of nasality and articulation are interpreted as suggesting that speech clinicians are more likely to differentiate between these two variables than other listener groups.

Speech clinicians evaluate speech for the purposes of identifying problems, determining their etiology and selecting appropriate management strategies. In most settings, clinicians who evaluate speech also provide therapy. If their initial evaluations are incomplete or inaccurate, therapy can be modified with a minimum of harm or inconvenience to the patient. Clinicians who work with interdisciplinary diagnostic teams face somewhat different circumstances. Their evaluations may be used to select treatment procedures that will be administered by other professionals, including physicians and dentists, whose therapy procedures are not easily modified. Under these circumstances, speech evaluations must be as complete and accurate as possible.

The Cleft Palate Maxillofacial Clinic at the University of Minnesota consists of an interdisciplinary team that conducts diagnostic evaluations and provides recommendations to patients and the professionals who treat them. In this setting, speech evaluations may strongly influence recommendations to proceed with surgical or dental treatment. The speech evaluations used are based, in part, on information obtained from patients, parents, teachers, speech clinicians and other professionals in the Clinic. Speech clinicians who serve on interdisciplinary teams are expected to interpret observations made by others and integrate them with their own observations which are made while the patients are in the Clinic.

In carrying out these tasks, clinic clinicians make assumptions regarding the validity and reliability of observations made by themselves and others. Unfortunately, substantiative data relating to these assumptions are limited. Bradford, Brooks and Shelton (1964), Counihan and Cullinan (1970), and Fletcher (1976) have presented data that question the use of perceptual judgements made by one person for clinical and research purposes. In response to this concern, our Clinic uses observations made by multiple listeners (i.e., three to six speech clinicians) to describe patients'

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speech characteristics while they are in the Clinic (Moller and Starr, 1984). However, we have not investigated relationships among observations made by our clinic clinicians and those made by other persons whose judgements we use in our diagnostic evaluations.

The purpose of this study was to describe the relationships among speech observations made by our clinic speech clinicians, speech clinicians working in other settings and the patients and parents who participate in our clinic.

Methods

In order to examine these relationships, a stimulus tape was prepared containing portions of the speech samples used by clinic speech clinicians to rate patients' nasality and articulation. Public school speech clinicians who directly serve clinic patients, patients and their parents, and children without clefts and their parents were asked to judge these speech samples using a rating procedure developed in this clinic. Mean ratings of nasality and articulation obtained from these groups were compared with each other and with those of our clinic speech clinician.

STIMULUS TAPE. A high quality audio recording of a 250 word reading passage was obtained under standard conditions in a sound-treated room for all patients at each clinic visit. This reading passage was used by clinic speech clinicians to evaluate and rate speech parameters including nasality, articulation, voice, and intelligibility. These recordings were used to construct the stimulus tape for this study. Detailed description of the recording procedures are presented elsewhere (Moller and Starr, 1984).

Recordings selected for the stimulus tape met the following criteria. (1) Patients were between the ages of 8 and 21 years. Data (Westra, 1982) indicate that most of this clinic's recommendations for management of speech problems occur within this age range. (2) Patients had repaired cleft palate and were free of associated problems that may affect speech, such as mental retardation and neuromuscular problems. (3) Patients exhibited normal, mild or moderate nasal resonance distortion as judged by all clinic clinicians present at the time the recording was made. Patients with severe nasality were not included because of the infrequent disagreement on the need for management of this group. (4) Patients within each nasality category exhibited a range of articulation deviations. Previous studies have demonstrated the potential effects of articulation problems on nasality judgements (Spriestersbach, 1955; Sherman, 1954). No effort was made to control for type of cleft, type of surgical repair, speech therapy history, socioeconomic status or sex.

Using these criteria, original recordings of 15 patients were identified and dubbed onto the stimulus tape in random order. Five of the samples contained normal nasality. Five had mild and five had moderate nasality. One sample in each nasality category had normal articulation. One or more had a mild articulation deviation and one or more had a moderate deviation.

RATING SCALES. The speech of clinic patients was evaluated through the use of equal-appearing interval and category scales. Speech parameters evaluated included intelligibility, nasality, articulation, voice, overall communicative adequacy and social acceptability. Only the equal-appearing interval scales used to rate nasality and articulation were included in this study. Eight point equal-appearing interval scales with "0" labeled normal and "7" labeled severe deviation were used to rate nasality and articulation.

Listener Groups and Conditions

CLINIC CLINICIANS. Clinic clinicians who rated patients' speech as part of clinic evaluations constituted one group of listeners. This group included two senior staff clinicians, an experienced graduate student who served as a clinical assistant, and varying numbers of graduate students assigned to the clinic as part of their practicum experience. The mean ratings of these clinicians were assigned to each speech sample. The number of clinicians contributing to the rating varied from three to six, with a mean of five.

Clinic clinicians rated samples under one of three possible listening conditions; 1)

one clinician always rated in a live setting; 2) one or more of the other clinicians rated while viewing the live session through a two-way mirror and listening to a loudspeaker connected to a high quality audio monitoring system; and 3) one or more of the clinicians rated while listening to a tape recording played through the same speaker without viewing the patient. Detailed description of rating procedures and listening conditions are presented elsewhere (Moller and Starr, 1984).

SCHOOL CLINICIANS. Twenty speech clinicians who served clinic patients in the public schools and had more than one year of clinical experience constituted another rating group. These clinicians were given information on each speaker's age, sex and type of cleft, along with verbal and written instructions on the use of the rating scales. They were provided with a high quality tape recorder, earphones, and the stimulus tape. Three additional speech samples were added to the tape to give them an opportunity to practice rating. They were told to listen to each sample as often as necessary and record their ratings on a protocol similar to the one used by clinic clinicians. School clinicians completed the ratings in their school settings. Mean ratings obtained from the 20 clinicians were assigned to speech samples.

PARENTS OF CHILDREN WITH CLEFT PALATE. Twelve parents who had children with cleft palate, between the ages of 6 and 21 years, served as another rating group. They were seen in the clinic in a sound treated room. Verbal and written instructions on rating procedures were given to them by one of the investigators and the stimulus tape was played for them on the same equipment used by the school clinicians. They were allowed to listen to each sample as often as necessary. Mean ratings made by these twelve parents were assigned to speech samples.

PARENTS OF CHILDREN WITHOUT CLEFT PALATE AND WITH NORMAL SPEECH. Twelve parents of children without cleft palate or other physical, intellectual and hearing deficits provided an additional set of ratings. They completed their ratings with the same equipment and procedures used by the parents of children with clefts, except that they participated in their own homes. Mean ratings obtained from this group were assigned to samples.

CHILDREN WITH CLEFT PALATE AND NASAL SPEECH. Twelve clinic patients who were judged to have nasal speech served as another group of raters. They were 8 years of age or older and free from other intellectual, physical or hearing deviations that might affect speech or the listening task. The same stimuli, procedures and settings used to obtain ratings from parents were used with this group. However, they listened to a shorter segment (10–15 seconds) of the 15 speech samples used to construct the stimulus tape. Mean ratings made by these twelve hypernasal speakers were assigned to speech samples.

CHILDREN WITHOUT CLEFT PALATE AND WITH NORMAL RESONANCE. Twelve persons with normal resonance, as judged by two of the investigators, served as the final rating group. They were matched for age and sex with the hypernasal speaker group. They were free of intellectual, physical or hearing problems. The same stimuli and procedures used with the hypernasal group were used to obtain ratings from this group. The mean ratings obtained from this group were assigned to each sample.

Results and Discussion

The purpose of this study was to describe relationships among ratings of nasality and articulation obtained from different groups of listeners. In order to analyze the data, mean ratings were computed for listener groups for each of the 15 speech samples. Information on nasality ratings is presented in Table 1.

Table 2 contains the results of a two way ANOVA used to analyze differences in ratings across listener groups and speech sample sets (i.e. normal, mild nasality, moderate nasality). Information in Table 2 indicates that both main effects are significant and that there is no interaction. Table 3 contains information from a post hoc analysis (Newman-Kuels) used to determine sources of variation across listener groups. Based on this analysis, all significant inter-

TABLE 1. Means of Nasality Ratings Obtained from Listener Groups

	Speech Samples	*Clinic Clinicians N = **	*School Clinicians N = 20*	*Parents of Cleft Children N = 12*	*Parents of Normal Children N = 12*	*Nasal Children N = 12*	*Normal Children N = 12*
Normal Nasality	1.	0	0	0	0	2.4	0
	2.	0	0	0	0	0	0
	3.	0	0	3.6	0	2.4	0
	4.	0	0	0	0	0	0
	5.	0	0	0	0	0	0
		$\bar{X}$ = 0	0	.7	0	1.	0
Mild Nasality	6.	2.3	3.2	3.5	3.6	3	0
	7.	2.	2.7	0	0	2.7	0
	8.	2.7	3.3	3.5	3.9	3.4	2.8
	9.	2.3	2.8	3.1	3.5	0	0
	10.	2.4	3.1	3.6	3.8	3.1	3.5
		$\bar{X}$ = 2.3	3.0	2.7	3.0	2.4	1.3
Moderate Nasality	11.	3.3	4.1	3.9	3.5	3.9	3.8
	12.	2.8	3.5	4.1	3.8	3.9	3.8
	13.	3.4	3.1	4.	4.2	2.5	0
	14.	3.6	6.1	6.	6.	4.3	4.8
	15.	3.7	4.6	4.5	4.3	3.9	4.3
		$\bar{X}$ = 3.4	4.3	4.5	4.4	3.7	3.3
	Overall $\bar{X}$	1.9	2.4	2.6	2.5	2.4	1.5

* The number of clinic clinicians rating each sample varied from 3 to 6, with a $\bar{X}$ of 5.

TABLE 2. Analysis of Variance for Listener Groups and Speech Sample Sets on Nasality Ratings

Source	*df*	*MS*	*F*	*P*
Columns (speech sample sets)	2	101.18	30.72	.001
Error	12	3.29		
Rows (listeners groups)	5	2.61	3.26	.01
Interaction	10	.88	1.11	.37
Error	60	.80		

group differences involve ratings made by the group of normal children. Data in table 1 show that the means for this group were lower than those provided by other listener groups. Table 4 presents a correlation (Pearson r) matrix computed to provide additional information on intergroup ratings of nasality. Inspection of this table reveals that the highest correlation (.96) is between clinic clinican and school clinician ratings. Correlations among children and parent group ratings range from .80 to .96. The range among children and parent groups is from .65 to .77.

Based on these analyses, we find no evidence that listener group ratings of nasality differ, except for those obtained from normal children. Lower ratings obtained from normal children may have occurred because they were less familiar with the concept of nasality and tended to restrict their ratings. Correlations among ratings obtained are relatively high, especially among the adult groups of listeners.

Table 5 presents information on articulation ratings. Results of a two-way ANOVA, presented in Table 6, indicate that the main effects across listener groups and sample sets are significant and that there is no interaction.

A post-hoc analysis (Newman Kuels), Table 7, indicates that four of the five significant differences between groups involved the group of children with nasal speech. The mean rating for this group is higher than the other groups. The only other significant difference is between school clinicians and parents of children with clefts, where the mean rating is higher for the clinicians. A correlation matrix for

TABLE 3. Newman-Kuels Test for Differences in Resonance Ratings Among Listener Groups

Normal Children $\bar{X} = 1.53$	*Clinic Clinicians* $\bar{X} = 1.91$	*Nasal Children* $\bar{X} = 2.37$	*School Clinicians* $\bar{X} = 2.43$	*Parents of Normal Children* $\bar{X} = 2.44$	*Parents of Cleft Children* $\bar{X} = 2.65$
Normal Children	.38	.84*	.90*	.91*	1.12*
Clinic Clinicians		.46	.52	.53	.74
Nasal Children			.06	.07	.28
School Clinicians				.01	.22
Parents of Normal Children					.21
Parents of Cleft Children					

* p = .05.

TABLE 4. Intercorrelations Among Listener Groups for Nasality Ratings on 15 Speech Samples

	Clinic Clinicians	*School Clinicians*	*Parents of Cleft Children*	*Parents of Normal Children*	*Nasal Children*
School Clinicians	96**				
Parents of Cleft Children	80**	81**			
Parents of Normal Children	91**	91**	90**		
Nasal Children	72**	75**	71**	65**	
Normal Children	70**	77**	70**	72**	75**

** p < 0.01.

TABLE 5. Means of Articulation Ratings Obtained for Listener Groups

	Speech Sample	*Clinic Clinicians* N = *	*School Clinicians* N = 20	*Parents of Cleft Children* N = 12	*Parents of Normal Children* N = 12	*Hypernasal Children* N = 12	*Normal Children* N = 12
Normal Nasality	1.	4.3	4.9	2.8	3.3	3.9	3.6
	2.	4.0	4.0	2.3	2.8	3.5	2.5
	3.	4.0	3.8	3.5	3.3	5.1	4.4
	4.	3.6	3.8	2.9	2.8	3.3	3.9
	5.	2.8	2.2	1.6	2.4	2.6	2.0
		$\bar{X}$ = 3.7	3.7	2.6	2.9	3.7	3.3
Mild Nasality	6.	4.5	4.6	3.6	3.8	4.8	4.2
	7.	3.6	3.5	2.4	3.0	3.8	2.7
	8.	3.3	5.0	3.8	3.8	5.5	5.3
	9.	4.2	4.1	3.5	3.8	4.2	3.4
	10.	4.4	3.8	3.3	3.3	3.9	4.0
		$\bar{X}$ = 4.0	4.2	3.3	3.5	4.4	3.9
Moderate Nasality	11.	4.8	5.5	4.5	3.8	5.3	5.4
	12.	4.0	3.7	3.4	3.6	5.6	4.0
	13.	4.8	4.6	3.5	3.9	4.1	4.7
	14.	4.5	6.2	5.5	5.7	6.8	6.3
	15.	3.7	4.8	4.0	3.8	5.9	5.3
		$\bar{X}$ = 4.4	5.0	4.2	4.2	5.5	5.1
	Overall $\bar{X}$	4.0	4.3	3.4	3.5	4.6	4.1

* The number of clinic clinicians rating each sample varied from three to six, with an $\bar{X}$ of five.

articulation ratings is presented in Table 8. Inspection of this table shows that intercorrelations that involve clinic clinicians range from .34 to .61 and that intercorrelations among the other groups range from .74 to .94.

Based on these analyses, we find no evidence to suggest that listener group ratings of articulation differ, except for those obtained from nasal children. Higher ratings obtained from nasal children may have occurred because of the emphasis placed on articulation by their parents and speech clinicians. Correlations among clinic clinicians ratings and those of other groups were somewhat low, but correlations among other groups were relatively high. The reason for this finding is not clear.

It is possible that the correlations were low because clinic clinicians differentiated between deviations in articulation and nasality, and the other groups tended to respond in a more undifferentiated manner. In an attempt to investigate this possibility, ratings of nasality were correlated (Pearson r) with those of articulation for adult listener groups. Correlation for clinic clinicians (.45) was found to be lower than those for school clinicians (.77), parents of children with clefts (.94), and parents of normal children (.95). These findings are in-

TABLE 6. Analysis of Variance for Listener Groups and Speech Sample Sets on Articulation Ratings

Source	*df*	*MS*	*F*	*P*
Columns (speech sample sets)	2	14.73	6.17	.01
Error	12	2.39		
Rows (listener groups)	5	3.01	12.87	.001
Interaction	10	.30	1.27	NS
Error	60	.23		

TABLE 7. Newman-Kuels Test for Differences in Articulation Ratings Among Listener Groups

	Parents of Cleft Children $\bar{X} = 3.37$	*Parents of Normal Children* $\bar{X} = 3.54$	*Clinic Clinicians* $\bar{X} = 4.03$	*Normal Children* $\bar{X} = 4.11$	*School Clinicians* $\bar{X} = 4.29$	*Nasal Children* $\bar{X} = 4.55$
Parents of Cleft Children		.77	.66	.74	.92**	1.18**
Parents of Normal Children			.49	.57	.75	1.01**
Clinic Clinicians				.08	.26	.52*
Normal Children					.18	.44*
School Clinicians						.26
Nasal Children						—

* $p < 0.05$.
** $p < 0.01$.

TABLE 8. Intercorrelations Among Listener Groups for Articulation Ratings on 15 Speech Samples

	Clinic Clinicians	*School Clinicians*	*Parents of Cleft Children*	*Parents of Normal Children*	*Nasal Children*
School Clinicians	.61**				
Parents of CP Children	.57**	.85**			
Parents of Normal Children	.54*	.83**	.92**		
Nasal Children	.34	.74**	.89**	.83**	
Normal Children	.46	.84**	.94**	.82**	.86**

* = .05.
** = .01.

terpreted as supporting the hypothesis that clinic clinicians are less likely than other listener groups to respond in an undifferentiated manner to nasality and articulation deviations.

Summary and Conclusions

This study describes the relationships among listener groups on ratings of nasality and articulation in selected speakers with cleft palate. Within the limitations of the study, the results permit the following conclusions.

1) Nasality ratings made by speech clinician groups, parent groups, and children with hypernasal speech do not differ significantly.
2) Intergroup correlations of nasality ratings are moderate to high. Correlations among adult groups are higher than among children groups and correlations between the two clinician groups are the highest.
3) Articulation ratings made by speech clinician groups, parent groups and children with normal speech do not differ significantly.
4) Clinic speech clinicians' ratings of articulation do not correlate highly with other listener groups, whereas other listener groups demonstrate high intergroup correlations. Analysis of relationships between articulation and nasality ratings suggests that this difference indicates that clinic clinicians' may differentiate between articulation and nasality more than other listening groups.

In general, speech clinicians' judgements of nasality are representative of other adult listener groups. However, further research is needed to explore the differences in nasality and articulation ratings among adults and children.

References

BRADFORD, L., BROOKS, A., and SHELTON, R., Clinical judgements of hypernasality in cleft palate children, *Cleft Palate J., 6,* 329–335, 1964.

COUNIHAN, D., and CULLINAN, W., Reliability and dispersion of nasality ratings, *Cleft Palate J., 7,* 261–270, 1970.

FLETCHER, S., "Nasalance" vs. listener judgements of nasality, *Cleft Palate J., 13:*31–44. 1976.

MOLLER, K., and STARR, C., The effects of listening conditions on speech ratings obtained in a clinical setting, *Cleft Palate J., 21:*65–69, 1984.

SHERMAN, D., The merits of backward playing of connected speech in the scaling of voice quality disorders, *J. Speech Hear. Dis., 19:*312–321, 1954.

SPRIESTERSBACH, D., Assessing nasal quality in cleft palate speech of children, *J. Speech Hear. Dis., 20:*266–70, 1955.

WESTRA, S., Velopharyngeal Insufficiency: Treatment recommendations, implementation, and effects on speech in a selected cleft palate population. Unpublished Master of Arts Thesis, University of Minnesota, 1982.