Oral Form Discrimination of Children with Cleft Palate

GENE PRESSEL, Ph.D.
IRVING HOCHBERG, Ph.D.
Hempstead, New York 11550

In an effort to ascertain the role of sensory and perceptual experiences in regulating oral motor performance one line of inquiry has been concerned with the assessment of sensory abilities of pathological groups of speakers on oral form recognition tasks. Two such investigations have dealt with cleft palate speakers. Mason (*3*) reported findings for a group of cleft palate individuals ranging in age from six to 45 years, and concluded that there was no apparent perceptual deficit among such persons. He further stated that this congenital anomaly was not accompanied by a congenital sensory impairment of the oral area. Oral form discrimination was studied also in 12 adult cleft palate speakers by Hochberg and Kabcenell (*2*). Their results indicated that subjects with cleft palate demonstrated inferior ability to discriminate oral stimuli in comparison to normal speakers.

Because of the apparent lack of information on a wide variety of cleft palate groups and the inconsistency of research findings with respect to oro-sensory discrimination of form, it is of sufficient interest to study further this capacity among this population. This study was designed to investigate the oral form discrimination performance of children with surgically repaired cleft palates in comparison to the performance of non-cleft palate children of comparable age.

Subject

Subjects were 60 children with surgically repaired cleft palates selected from three cleft palate centers in New York. They ranged in age from 5 years, 2 months to 8 years, 11 months, and had a mean age of 6 years, 11 months. A group of 60 non-cleft palate children served as controls. They ranged in age from 5 years, 9 months to 8 years, 10 months, and had a mean age of 7 years, 4 months.

Both subject groups passed an audiometric screening test in both ears at 20 dB (ISO 1964) between octave frequencies of 500 to 4000 Hz. All children were judged to be free of gross intellectual impairment according

Gene Pressel, Ph.D., Hofstra University, Hempstead, New York.
Irving Hochberg, Ph.D., Brooklyn College of the City University of New York, Brooklyn, New York.

to their school records and grade placement. Normal subjects did not manifest speech disturbances, nor any congenital or acquired anomalies.

Stimuli

Oral stimuli were those developed at the National Institute of Dental Research and reported by Shelton, Arndt and Hetherington (*6*). Ten of the original 20 forms were selected for testing purposes based on the findings of Moser, LaGourge and Class (*4*) and Ringel, Burk and Scott (*5*). Forms were classified into four geometric groups: Group I, triangular (forms 1 and 2); Group II, rectangular (forms 3, 4 and 5); Group III, oval (forms 6, 7 and 8); and Group IV, biconcave (forms 9 and 10). The geometric forms used are presented in Figure 1.

Procedure

The assessment of oral form discrimination was carried out by means of the method of paired-comparison. The order of stimulus presentation was randomly predetermined for each subject. Each child was instructed to explore with his tongue the shape of each of the pair of forms and to report whether they were the same or different. Five seconds elapsed between inter-stimuli presentations; no time limit was prescribed for oral examination of each stimulus. The total number of paired comparisons was 55. Each pair was employed only once; the presentation of pair 1 and 2 precluded the use of pair 2 and 1.

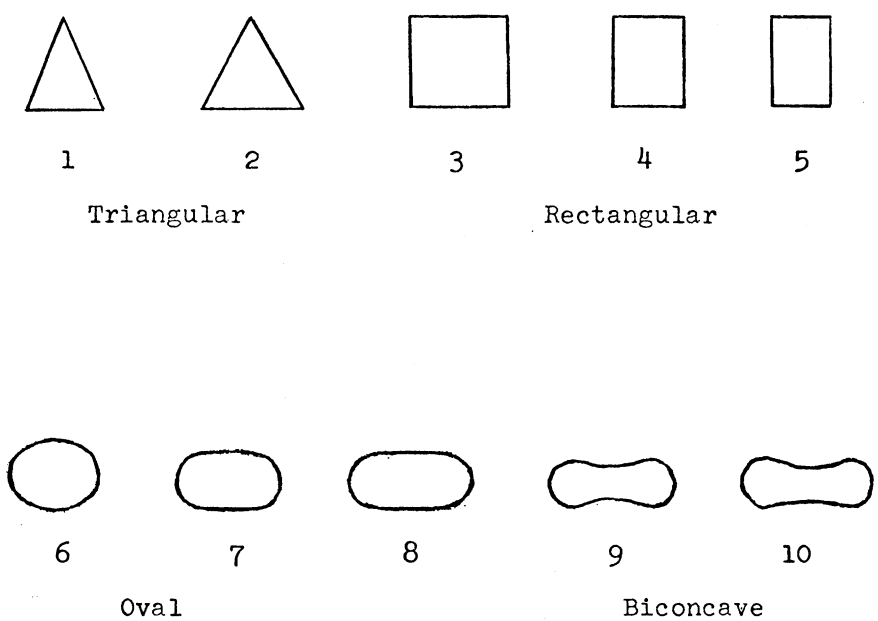

FIGURE 1. Geometric forms used for testing of oral sensory discrimination.

TABLE 1. Summary of error performance on oral form discrimination for normal and cleft palate subjects.

subjects	*no. of errors*	*mean*	*SD*	*t*	*p*
normal	602	10.03	3.80	2.31	$< .05$
cleft palate	715	11.92	5.03		

Results and Discussion

The data were analyzed according to the several types of error that were demonstrated. Between-form errors were considered to be confusions between stimuli from two different form groups (e.g., when a rectangle and an oval were confused). Within-form errors were considered to be confusions between stimuli from the same form group (e.g., when two different rectangles were confused, or when the same item was compared to itself and confused.

Within-form errors were subclassified into identity and non-identity errors. Identity errors were those in which the same pair of forms elicited a response of "different." Non-identity errors were those in which two different forms elicited a response of "same."

The summary of error performance for both normal and cleft palate subjects is presented in Table 1. The mean number of errors made by cleft palate subjects was significantly greater ($t = 2.31$; $p < .05$) than for normal subjects. In order to determine the strength of association of the difference between subject groups, an estimated *omega square* was computed (*1*). It was found that the presence or absence of cleft palate accounted for approximately 3.5 percent of the variance of the obtained scores, thereby reflecting relatively little strength of association.

Table 2 shows the comparison of mean error performance in relation to type of error. Normal subjects demonstrated significantly fewer within-form errors than did cleft palate subjects. Both groups, however, showed a comparable number of between-form errors.

Inspection of the inter-stimulus confusions revealed that the greatest number of errors for both groups of subjects occurred between adjacent

TABLE 2. Summary of between- and within-form errors for normal and cleft palate subjects.

error	*number*	*mean*	*SD*	*t*	*p*
between-form					
normal	314 (.52)	5.23	3.34	0.77	ns
cleft palate	346 (.48)	5.77	4.28		
within-form					
normal	288 (.48)	4.80	1.45	4.55	$< .01$
cleft palate	360 (.52)	6.15	1.79		

TABLE 3. Distribution of errors demonstrated by normal and cleft palate subjects.

form group	*triangular*		*rectangular*		*oval*		*biconcave*	
	norm	*cp*	*norm*	*cp*	*norm*	*cp*	*norm*	*cp*
triangular	52	61						
rectangular	52	37	87	112				
oval	16	34	87	109	97	130		
biconcave	6	17	42	44	111	105	52	66
total	126	149	268	302	311	378	211	232

This table is interpreted as follows: Total number of errors is the sum of the entries of the corresponding rows and columns for each subject group. For example, the total of 302 errors made by cleft palate subjects for rectangular stimuli is the sum of 37, 112, 109 and 44.

forms within each respective form group, with the exception of form 5. The latter stimulus was more frequently confused with those forms having a similar general configuration, such as a triangle or rectangle. This form elicited the greatest number of between-form errors for both groups of children. Normal subjects never confused six of the paired stimuli (1–10; 2–6; 2–9; 3–10; 4–9; and 4–10), whereas cleft palate children confused each form with another at least once.

The total number of confusions demonstrated by each group is shown in Table 3. Oval-shaped forms were apparently the most difficult to identify, whereas triangular-shaped forms were the easiest to recognize. The difference between groups appears to be related to the number rather than to the type of errors made.

The data were also analyzed in terms of the total number of between-form and within-form errors in relation to form groups. Table 4 shows that oval forms elicited the largest number of both types of error, whereas triangular forms elicited the least number of errors.

To determine the extent of inter-group confusions, a comparison of form group dyads with respect to total error performance is presented in Table 5. The greatest amount of confusion occurred between oval and rectangular

TABLE 4. Distribution of between- and within-form errors for normal and cleft palate subjects.

form group	*between-form errors*		*within-form errors*	
	normal	*cl palate*	*normal*	*cl palate*
triangular	74	88	52	61
rectangular	181	190	87	112
oval	214	248	97	130
biconcave	159	166	52	66

TABLE 5. Distribution of errors according to form-group dyad for normal and cleft palate subjects.

dyad	*normal*	*cleft palate*	*total*
triangular-rectangular	52	37	89
triangular-oval	16	34	50
triangular-biconcave	6	17	23
rectangular-oval	87	109	196
rectangular-biconcave	42	44	86
oval-biconcave	111	105	216

and between oval and biconcave forms. The least number of confusions occurred between triangular and biconcave stimuli.

Both subject groups demonstrated identity and non-identity within-form errors. Cleft palate subjects obtained a significantly greater number ($X^2 = 27.83$; $p < .001$) of identity errors (103 errors) than did normal subjects (34 errors).

To ascertain the contribution of each form to the number of errors made, forms were rank-ordered for each group with respect to relative difficulty of identification. There was little variation between groups in terms of ease or difficulty in recognition (rho = 0.95). Both groups found the same forms to be similarly easy or difficult to discriminate. It was noteworthy that oval stimuli included the least difficult stimulus (form 6) and most difficult stimuli (forms 7 and 8).

Although our analysis of data provided a variety of inter-group differences of varying magnitudes, our primary interest was to evaluate the extent to which cleft palate children as a group compared to non-cleft palate children in their ability to discriminate orally a series of geometric forms. Our findings indicate that our sample of children with surgically repaired clefts of the palate did manifest significantly poorer ability in this recognition task than did a comparable group of non-cleft palate children. However, this finding must be interpreted with caution as it was observed that the difference between group performance was dependent upon only 3.5 percent of inter-group variance. The relatively minimal strength of association from a statistical point of view raises perhaps the more important question of the meaningfulness of the observed difference. On the basis of these data we cannot conclude that meaningful differences exist between cleft palate and non-cleft palate children with respect to oral form discrimination, even though such differences may be observed statistically among samples of such populations. Subsequent investigation may reveal the nature of these differences. Further study is suggested along the following lines of inquiry: (a) an item analysis of the test stimuli employed to evaluate the internal consistency of the test procedure or of its major subcomponents: (b) an investigation of subject's preferences for certain test stimuli in relation to their actual performance utilizing the semantic differ-

ential procedure as a possibility: (c) an investigation of several aspects of oro-sensory ability in these children with oral form discrimination being one of several measurements: (d) an exploration of the type of oro-sensory perception that appears to predominate in the cleft palate child, e.g. tactile, kinesthetic, deep pressure and (e) a study of oral form discrimination in relation to various speech and/or non-speech activities, keeping in mind that the central pathways mediating speech and non-speech activities are essentially different.

Summary

Oral form discrimination was evaluated among 60 children with surgically repaired cleft palates and 60 non-cleft palate children of comparable age. Ten of the original 20 forms developed at N.I.D.R. were employed as stimuli and were presented in pairs of stimuli for paired-comparison response. Data were analyzed in terms of various types of error observed. The major finding of this study indicated that cleft palate children did manifest inferior mean performance on oral form discrimination in comparison to their non-cleft palate counterparts. However since the significance of the difference was accounted for by only 3.5 percent of the variance between groups, the question of the meaningfulness of this difference was raised in interpreting this finding.

reprints: *Gene Pressel, Ph.D.*
Hofstra University
Department of Speech Arts and Sciences
Hempstead, New York 11550

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