

Therapeutic Exercise and Velopharyngeal Gap

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The physiological characteristics of velopharyngeal function during blowing, sucking, and swallowing exercises have been described by several authors, as well as the possibilities for using these exercises to increase velopharyngeal function during speech. Although the reports are generally descriptive in nature, the information provided from such investigations may be useful in understanding the possible results which may be expected from therapeutic exercises which involve these activities.

Findings by Moll (4) and Bloomer (1) indicate that there is less sphincteric action of the velopharyngeal mechanism in speech than in swallowing. In addition, McWilliams and Bradley (3) suggest that speech demands velar-pharyngeal behavior which is physiologically different from that required for blowing.

Shelton (6) maintained that velopharyngeal movement is greater during deglutition than during speech and that this difference becomes significant when fitting an obturator to facilitate velopharyngeal closure. He further noted that the obturator might help to enhance greater movement of the palatopharyngeal muscles.

Several authors (2, 5, 7) have suggested that the activities of swallowing, blowing, and sucking may be used as therapeutic devices to facilitate velopharyngeal closure during speech sound production. West, Ansberry, and Carr (7) cite two objectives for using therapy devices such as blowing exercises: to effect a closure of the nasopharyngeal port in order to increase the intraoral pressure needed for consonants, and to obtain resonance control for the production of vowels and semi-vowels. Morley (5) indicated that blowing exercises may be useful in adjusting the position of the tongue in order to obtain least resistance to the air stream coming through the vocal tract. She also stated that blowing exercises may facilitate compensatory movements of the posterior and lateral pharyngeal walls and the soft palate and may increase mobility.

This research study was supported by PHS Research Grant DE-01899, National Institute of Dental Research.

She cited an example of an individual with an immobile soft palate accompanied by a nasal tone who achieved complete nasopharyngeal closure after blowing exercises. Luchsinger and Arnold (2) also stated that blowing exercises help to facilitate nasopharyngeal occlusion and provide stimulation as well as motivation.

The present investigation, using cinefluorographic films, was undertaken in an attempt to study the effect of blowing, sucking, and swallowing exercises upon velopharyngeal closure.

Procedure

Thirteen subjects were used, all of whom had had surgically repaired cleft palate. Cinefluorographic films were made before and after the subjects had completed a training period utilizing blowing, sucking, and swallowing exercises. They ranged in age from eight to eighteen years; the only restriction placed on the sample was that no subject might demonstrate velopharyngeal closure, as shown by cinefluorographic analysis.

The subjects were divided into three groups. Group A practiced blowing exercises such as on a manometer or with a blowing device. Group B practiced sucking exercises such as sucking through a straw or with a meter which indicated the amount of pressure. Group C practiced swallowing exercises, primarily that of placing the index finger on the neck in the area of the thyroid cartilage in order to feel movement in the neck during swallowing. During this exercise the subjects were instructed to begin to swallow, stop momentarily, and then continue. With practice, subjects in Group C were able to prolong the swallow for progressively longer periods of time.

The subjects performed the exercises for a period of twenty minutes each morning and each afternoon for 27 consecutive days. During that time they also had intensive articulation therapy. Such a regime was possible because the subjects were attending a residential speech camp.

Cinefluorography films for /i/ and /u/ were obtained for each subject before and after the period of therapy. A Philips cinefluorography unit with a 6-inch image intensifier was used. The camera speed was twenty-four frames per second. Measurements in millimeters were made of the amount of velopharyngeal opening during the phonation.

Results

Pre- and post-therapy measurements are reported in Table 1 for each subject. The degree of change in velopharyngeal gap was estimated for each of the three treatments (Table 2). The estimated change was defined as the mean difference between velopharyngeal gap before therapy and velopharyngeal gap after therapy. Of the three groups, significant differences were obtained only for the group which had swallowing exercises, shown for both /i/ and /u/. Smaller velopharyngeal gaps

TABLE 1. Measurements of velopharyngeal gap, in mm, for 13 subjects for /i/ and /u/ obtained before and after therapy.

subject	before therapy		after therapy	
	/i/	/u/	/i/	/u/
<i>exercise—swallowing</i>				
A	10	10	3	4
B	4	5	1	2
C	8	13	4	8
D	4	5	0	0
E	8	5	7	7
<i>exercise—blowing</i>				
F	10	10	10	10
G	15	13	14	14
H	4	5	0	1
I	15	18	18	22
<i>exercise—sucking</i>				
J	23	24	23	21
K	13	13	7	7
L	24	22	7	6
M	23	20	19	22

TABLE 2. Mean difference, in mm, between velopharyngeal gap before therapy and velopharyngeal gap after therapy. Values which are significant at the 5% level are asterisked.

exercise	mean difference	
	/i/	/u/
swallowing.....	3.80*	3.40*
blowing.....	0.50	0.00
sucking.....	6.75	5.75

were demonstrated after therapy than before therapy. The absolute gains in velopharyngeal gap for the group which had sucking exercises was greater than those for the group which had swallowing exercises, however. The greatest relative improvement (50% of the pre-therapy gap) occurred in the swallowing group; the sucking group showed a relative decrease in size of 31%. The blowing exercise appeared to have essentially no effect.

Summary

Thirteen individuals with surgically repaired cleft palate were divided into three groups for swallowing, sucking, and blowing exercises. Cinefluorography films were made of each subject before and after the twenty-seven day training period. Measurements were made of the amount of velopharyngeal opening during /i/ and /u/. Significant differences were obtained only for the group which had swallowing exercises.

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