

Original article

Speech camp for children with cleft lip and/or palate in Thailand

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Background: There is a critical need for speech therapy services for people born with cleft lip and/or palate in developing countries.

Objective: Assess the effectiveness of a speech camp and follow-up session for children with cleft lip and/or palate.

Methods: A Community-Based Model for Speech therapy was implemented at Suwanaphum Hospital District, Roiet, Thailand. Thirteen children with cleft lip and/or palate (3; 6-13 years) attended a four-day speech camp and a one-day follow-up session (six months later) for remediation of their articulation disorders. Paraprofessional training was also provided. Pre- and post-tests were administered to the participants, caregivers, and paraprofessionals to determine the effectiveness of the program. A pre- and post-articulation test, as well as an audiological evaluation were administered. Five speech and language pathologists provided speech therapy, both individual and group, for a total of 18 hours during the four-day speech camp and six hours in the one-day follow-up session. The median difference of the number of articulation errors was determined by results of the Wilcoxon Signed-Rank Test.

Results: There was a significant decrease in articulation errors following both the main speech camp and the follow-up session ($z = 3.11, p < 0.01$; $z = 2.87, p < 0.01$, respectively). Caregivers' and health care providers' satisfaction ratings for participation in the speech camps ranged from good to excellent.

Conclusion: A Community-Based Model of both a speech camp and follow-up session provided an effective speech therapy treatment for children with cleft lip and/or palate.

Keyword: Cleft palate, community-base model, developing country, speech camp

Cleft lip and/or palate are among the most common birth defects. This is especially true in developing countries where higher incidences occur. The causes are associated with genetics [1], nutritional deficiencies, e.g., poor maternal vitamin and nutritional supplements [1, 2], as well as the expectant mother's

tobacco and alcohol consumption [3, 4]. The worldwide incidence of cleft lip and/or palate is between 0.30 and 2.65/1,000 live births [5], as compared to Thailand, where the incidence of cleft lip and/or palate is between 1.10 and 2.49/1,000 live births [6]. Not surprisingly, most of the affected persons live in the lower socioeconomic status area of Northeastern Thailand, where the annual occurrence of births with cleft lip/palate is about 745 each year [5].

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There are surgical teams that provide services to repair the cleft lip and/or palate [5, 7]. However, most of these teams only address the physical issues [7, 8]. Surgery can reduce the physical abnormality of these people, but they still suffer the stigma that results from their speech and language problems. After surgery articulation issues related to the residual abnormal structure and velopharyngeal insufficiency can remain. Articulation disorders that influence intelligibility occur in 51-63 % of the cases [9], dysphonia is exhibited in 12.5 % [10], and the incidence of velopharyngeal incompetence is 20-30% [11, 12]. There are also significant speech and language deficits that stem from middle ear effusion, environmental deprivation, and/or pain while speaking after surgery. The incidence of speech and language delay is 92%, of which 49% require speech and language treatment [13]. Like in other developing countries, speech and language problems in cleft lip and/or palate in Thailand have remained a critical issue [14-17]. Most children with cleft lip and/or palate, particularly those who live in the Northeast of Thailand, either receive speech therapy later in life or not at all because of the lack of qualified speech-language pathologists [18]. Currently, in a country of 63 million people, there are only forty active speech and language pathologists. Most of them work in Bangkok, with the exception of five in the North, four in the South and one in the Northeast (where one-third of the population resides) [19]. Several reasons for this situation were addressed in our previous article [18].

To help alleviate this problem, Prathanee, et al. has established a community-based model for speech therapy for children with cleft lip and/or palate in the Northeast of Thailand by combining the principle of community-based rehabilitation (CBR), Primary Health Care (PHC), and institutional medical approaches. These models are explained in a previous article [18]. The speech camp was designed with the aforementioned model in mind and specifically addressed how to compensate for the lack of speech therapy services available to persons with cleft lip and/or palate in Thailand [18]. The purpose of this study was to assess the effectiveness of the speech camp and follow-up one-day camp held in June 2007 and December 2007, respectively.

Methods

A speech camp for individuals with cleft lip and/or palate was conducted at Suwanaphum Hospital,

Suwanaphum District, Roiet Province, Northeast region, Thailand. A speech therapy manual was developed that included an articulation test, speech and language therapy goals, and simple articulation correction techniques for children with cleft lip and/or palate.

Thirty participants, including 13 caregivers or parents, 13 children with cleft lip and/or palate, and four health-providers, enrolled in the main speech camp for four days. The principle investigator assessed pre- and post-articulation skills by using an articulation Test (word picture naming), resonance, and voice quality. The other researchers completed an oral peripheral examination, language assessment, intelligibility evaluation, and a hearing acuity test. Articulation skills were measured by the number and type of errors produced. A three-point scale evaluated resonance as normal, hyponasality, or hypernasality. Voice was assessed by using GIBRAS (G=grade, I=instability, R=roughness, B=breathiness, A=asthenia, and S=strain; each parameter score was defined as 0=normal, 1=mild, 2=moderate, and 3=severe). If all parameters of the GIBRAS were scored as 0, voicing was defined as normal, however, if any parameter was scored >0, voicing was defined as abnormal [20, 21]. For the speech and language screening, an adaptation of Utah Test of Language Development [22] was used and was scored as pass or fail. Intelligibility was rated by evaluating the answers of six questions that were asked to each participant. A child was rated as passing when the assessor understood and accepted at least 2/3 of the child's answers.

Five speech and language pathologists and one audiologist directed the Speech camp. Lectures that included the topics of anatomy and physiology of speech production, normal development of speech and language, as well as hearing disorders in cleft lip and/or palate were presented to caregivers and health care providers. Basic knowledge related to cleft lip and/or palate was assessed before and after the lectures. Direct, individualized, and group speech therapy was also provided for speech correction. Caregivers and health providers were responsible for their children's speech program after the speech and language pathologists demonstrated and assigned practice activities. Individualized home programs for carry over were developed and provided to the caregivers and health providers.

A one-day follow-up session was provided six months later by the principle investigator, a coauthor

and two speech and language assistants. The investigators and assistants provided a speech therapy workshop to address any residual articulation defects. The principle investigator administered a post articulation test at the end of the session.

The main outcome of the study was the number of articulation errors. Data analysis was performed by comparing the number of pre- and post- articulation errors during the main speech camp and the one-day follow-up session, as well as, the participants' pre- and post-knowledge scores. The Wilcoxon Signed-Rank Test was used to demonstrate the effectiveness of speech therapy

Result

Thirteen children with cleft lip or/and palate were included in the speech camp. Demographic characteristics of these children are shown in **Table 1**.

Ear, Nose, and Throat examination and hearing evaluation

A physician performed an ear, nose, throat

examination. An audiologist assessed hearing using audiometry (average pure tone 500-2000 Hz) and tympanometry. A summary of the children's hearing levels are exhibited in **Table 2**. One boy (patient number six) presented with a bilateral sensorineural hearing loss at 6000-8000 Hz, however, this deficit did not affect speech perception because his hearing acuity was in the average range for the lower frequencies where speech is perceived. A hearing assessment was not available for one girl (patient number two) because she missed the hearing evaluation. Average pure tone audiometry for the group measured 16.9 dB in the left ear and 17.18 dB in the right ear. These average hearing acuities were in the normal hearing range.

Pre- and post-knowledge

The participants' post-knowledge assessments indicated that their knowledge related to speech, language, and hearing problems in children with cleft lip and/or palate were significantly higher than their pre-test scores ($z = 2.906, p < 0.01$).

Table 1. Demographic characteristics of children with cleft lip or/and palate.

Patient Number	Age Year; month	Cleft type	History family of CLP	Mother's tongue language	Age at Chioplasty Years; month	Age at Palatoplasty Years; month	Mother's education level	Father's education level
1	7;2	CP	-	NE	-	2;0 and 4;0*	Primary	Undergrad
2	11;5	CP	-	NE	-	8;0	Primary	Primary
3	8;0	Lt. CLP	Grandfather	NE	0;3	2;0	Primary	Secondary
4	7;0	Lt. CLP	-	NE/CT	N/A	N/A	Primary	Primary
5	6;3	CL	-	NE/CT	0;9	-	Primary	Primary
6	12;6	Lt. CLP	-	NE	2;0	N/A	N/A	Secondary
7	4;6	Lt. CLP	Father's grandchild	NE/dialect	0;4	1;3	Secondary	Secondary
8	10;1	CP	Father's grandchild	NE/CT	N/A	N/A	Primary	Primary
9#	12 ;5	Bilat. CLP	Sibling	NE/CT	0;7	8 ;0	Secondary	Primary
10#	9;11	Bilat. CLP	Sibling	NE/CT	0;3	2;0, 5;0 and 7;0*	Secondary	Primary
11	10;0	Rt. CLP	-	NE	1;0	Have not been performed	N/A	N/A
12	11;3	Lt. CLP	N/A	NE	0;6	9;0 and 10;0*	Primary	Primary
13	10;2	Bilat. CLP	N/A	NE	2;0	3;0 (5-6 times)	Illiteracy	Primary

Lt.: Left; Rt= right

CL: Cleft lip

CLP: Cleft lip and palate

Bilat.: Bilateral

NE: Northeastern Thai language

CT: Central Thai language

N/A: not available, caregiver/ parent could not give information

Undergrad.: Undergraduate

All children had no syndrome

* palatoplasties were performed more than 1 time

They are sibling

Table 2. Hearing acuity of children with cleft lip and/or palate.

Patient number	Right hearing		Left hearing	
	Audiometry (dB)	Tympanogram	Audiometry (dB)	Tympanogram
1	20	A	17	A
2	N/A	N/A	N/A	N/A
3	20	A	15	A
4	18	A	18	A
5	18	A	17	A
6*	13	A	13	A
7	25	A	22	A
8	10	Impact cerumen/ remove	18	Impact cerumen/ remove
9	13	A	15	A
10	22	Impact cerumen/ remove	17	Impact cerumen/ remove
11	17	A	22	A
12	13	A	17	A
13	17	C	13	C

*Bilateral high frequency sensorineural hearing loss at 6,000-8,000 Hz.

The effectiveness of speech camp and the 1-day follow up session

The number of articulation errors of the participants is displayed in **Table 3**. The effectiveness of the speech camp was assessed by evaluating the mean difference in the number of articulation errors noted on the pre- and post-articulation tests (Pre 1 and Post 1 in **Table 4**). Twelve of the 13 children with cleft lip and/or palate participated in the main speech camp for four days with the exception one boy (child number 13) who attended only the last day of the main speech camp because of a logistical misunderstanding. His pre-articulation deficits were measured on the last day of the four days main speech camp and were used as pre-articulation test (Pre 2) compare to post-articulation test (Post 2) on the 1-day follow-up speech session (**Table 4**). On the other hand, one girl (child number 2) did not attend the follow-up speech camp. Therefore, follow-up analysis did not include her speech defects.

The differences of children's median scores both for the main speech camp and the one-day follow up session indicated a significant reduction of articulation errors, as shown in **Table 4**.

Parents' or caregivers' and health providers' satisfaction

Parents, caregivers, and health providers were given surveys to rate their satisfaction of the speech

camp. These surveys included a five point rating scale on 10 different areas and included appropriate lecturers, lecture contents, speech therapy activities, comprehension of manual, hospitality during speech camp and follow up session, audio-visual aids and equipments, activities of speech camp and follow-up session, benefits from speech camp and follow-up session, suit of place and facilities for speech camp and follow-up session, and quality of food. A calculation of these results indicated that 91.67% of these attendees rated the program from good to excellent.

Discussion

Unlike previous researchers that found a high prevalence of hearing problems in children with cleft palate [23-25], the average hearing acuity for this group of children was within the normal range. Most of the children with cleft lip and/or palates in this speech camp (11/13) were school age (7-13 years) or older. Their maturity may have been a factor in this finding. Older children present with a more sloped Eustachian tube, which usually results in better overall functioning, including better drainage, protection, and ventilation of the middle ear. A significant reduction in the number of articulation errors in both the main speech camp and follow-up session indicate that this treatment methodology was effective. This proved to be an effective program to implement speech therapy to a specific demographic in a developing country

Table 3. Characteristics of speech and language, and articulation errors of children with cleft lip and/or palate.

Child No.	Facial & oral examination	Language screening	Intelligibility	Resonance	Voice	Pre-articulation errors (Pre 1) [®]	Post-articulation errors (Post1) [®]	Pre-articulation errors (Pre2) [®]	Post-articulation errors (Post2) [®]
1	-Short_velum - Decayed teeth	Pass	Pass	Normal	Normal	/ŋ/ /w/ /l/ /r/ /i:ə/ /w:ə/ /i:ə/ /wəi/	-	(0)	(0)
2	- Short_velum - Two rows of_teeth*	Pass	Pass	Hyper_NE	Normal	/l/ /r/ /k/ /t/ /i:ə/ /w:ə/ /i:ə/ /wəi/	/i:ə/ /w:ə/ /i:ə/ /wəi/	N/A (Not FU)	N/A (Not FU)
3	- Palatal_fistula 1x2_milimeter ² - Lt alveolar cleft - Tight lips - Two rows of_teeth*	Delayed	Pass	Normal	Normal	/k ^h / /f/ /k/ /f/ /d/ /l/ /k/ /tə/ t ^h tə ^h /h/ /k ^h / /d/ /t/ / _p/ / _v/ / _p/ / _n/	/k ^h / /f/ /k/ /f/ /d/ /l/ /k/ /tə/ /h ^h / /s/ /d/ /t/ / _p/ / _v/ / _p/ / _n/	/k ^h / /f/ /k/ /f/ /d/ /l/ /k/ /tə/ /h ^h / /s/ /d/ /t/ /d/ /t/	/k/ /f/ /d/ /l/ d/ /t/ /h ^h / /s/ /d/ /t/
4	- Lt. nostril_smaller than _Rt. Nostril - Decayed teeth - Short_velum - Teeth misalignment - Malocclusion - Lt alveolar cleft 1x3_milimeter ²	Delayed	Not pass	Hyper	Normal	/m/ /b/ /n/ /d/ /s/ /tə ^h / /r/ /k/ /l/ /t/	/s/ /tə ^h / /r /jŋ ^h / /j/	/s/ /tə ^h / /l/ /j/ /jŋ ^h / /j/	/s/ /tə ^h / /l/ /t/ /jŋ ^h / /j/
5	- Mild short_frenulum	Pass	Pass	Normal	Abnormal	/tə ^h / /s/ /s/ /tə ^h / /l/ /t/ (3)	s/tə ^h /l/ /t/ (2)	s/tə ^h /l/ /t/ (2)	/l/ /t/ (1)
6	- Decayed_teeth - Lt. alveolar_cleft - Lip_asymmetry - _Malocclusion - Teeth_misaligment	Delayed		Hyper	Normal	/m/ /b/ /w/ /f/ /n/ /d/ /h/ /k ^h / D/ /s/ /s/ /tə ^h / /r/ /t/ /h/ /k/ /h/ /k ^h / /l/ /t/ /i:ə/ /wəi/	/m/ /b/ /w/ /f/ /n/ /d/ /h/ /k ^h / D/ /s/ D/ /tə ^h / /r/ /t/ /h/ /k/ /h/ /k ^h / /l/ /t/ (9)	/m/ /b/ /w/ /f/ /n/ /d/ /h/ /k ^h / D/ /s/ D/ /tə ^h / /r/ /t/ /h/ /k/ /h/ /k ^h / /l/ /t/ (9)	/m/ /b/ /n/ /d/ /h/ /k ^h / /l/ /t/ (5)
7	- Lt. flat_nostril - Lt. alveolar_cleft - _Malocclusion - Upper_central teeth_missing	Pass	Not pass	Normal	Normal	/r/ /p ^h / /m/ /b/ D/ /f/ /m/ /d/ /t/ /t ^h / /l/ /s/ /tə/ /tə ^h / /n/ /j/ /r/ /k/ /r/ /k ^h / /r/ /h/ /l/ /t/ /i:ə/ /w:ə/ (13)	/w/ /f/ /w/ /f/ /t/ /t ^h / /t/ /s/ /k ^h / /tə ^h / /r/ /k/ /r/ /k ^h / /k ^h / /h/ /l/ /t/ /i:ə/ /w:ə/ (9)	/w/ /f/ /w/ /f/ /t/ /t ^h / /t/ /s/ /k ^h / /tə ^h / /r/ /k/ /r/ /k ^h / /k ^h / /h/ /l/ /t/ /i:ə/ /w:ə/ (9)	/r/ or /tə ^h / /h/ /tə/ /tə ^h / /r/ /k/ /r/ /k ^h / /k ^h / /h/ /l/ /t/ (7)
8	- Teeth_misaligment - Palatal_fistula 1x5_milimeter ²	Pass	Pass	Normal	Normal	/l/ /t/ /e:u/ /e:u/	/l/ /t/ (2)	/l/ /t/ (1)	/l/ /t/ (1)
9	- Flat nose - Malocclusion	Pass	Pass	Hyper	Normal	D/ /s/ /tə ^h / /j/	D/ /s/ /t/ /k/	D/ /s/ /t/ /k/	- /tə/ /k/

Table 3. Characteristics of speech and language, and articulation errors of children with cleft lip and/or palate. (continued)

Child No.	Facial & oral examination	Language screening	Intelligibility	Resonance	Voice	Pre-articulation errors (Pre 1)*	Post-articulation errors (Post1)*	Pre-articulation errors (Pre2)*	Post-articulation errors (Post2)*
	- Short velum					/t/ /k/	/t/ /t/	/t/ /t/	
						/t/ /t/			
						/i:ə/ /w:ə/	(3)	(3)	(1)
10	- Short velum - Teeth misalignment - Decayed teeth - Malocclusion -no clear cupid bow	Delayed	Pass	Hyper Facial grimace	Normal	/m/ /b/	/m/ /b/	/m/ /b/	-
						/n/ /d/			
						/s/ /tʰ/			
						/tʰ/ /k/			
						/i:ə/ /w:ə/			
						/i:ə/ /wəi /			
						(6)	(1)	(1)	(0)
11	- Rt. Flat nose - Rt. lip smaller than Lt. lip - Teeth misalignment - Decayed teeth	Pass	N/A	Hyper NE Facial grimace	Normal	/t/ /t/	/t/ /t/	/t/ /t/	
						/kʰ/ /kʰ/	/kʰ/ /kʰ/	/kʰ/ /kʰ/	/tʰ/ /s/
						/tʰ/ /s/	/tʰ/ /s/	/tʰ/ /s/	/tʰ/ /s/
						/kʰ/ /k/	/kʰ/ /k/	/kʰ/ /k/	/h/ /k/
						/t/ /t/			
						/u/ /w:/			
						/u:ə/ /wəi /			
						(7)	(4)	(4)	(2)
12	- Lt flat nose - Lip asymmetry - Teeth misalignment - Decayed teeth - Malocclusion - Lt. alveolar cleft	Pass	Pass	Normal	Normal	/t/ /t/	-	-	-
						(1)	(0)	(0)	(0)
13	-Teeth misalignment - Bilat. Alveolar cleft	Delayed	Not pass	Hyper Facial grimace	Abnormal	N/A	N/A	/w/ /f/	
								/t/ /s/	
								/t/ /t/	/t/ /t/
								/e:w/ /e:w/	
								/i:ə/ /w:ə/	/i:ə/ /w:ə/
								(5)	(2)

Note: Child number 2 attend only the main speech camp; Child number 13 attend only the last day of the main speech camp and a follow up session; @: Figures in parenthesis are the numbers of individual’s articulation errors; *: Coarticulation
Hyper: Hypernasality; N/A: Not available; NE: Nasal emission

Table 4. Comparisons pre- and post- articulation tests.

Parameter	Number of articulation defects for the main camp					Number of articulation defects for the followed up-camp				
	Pre 1	Post 1	n	Z	p-value	Pre 2	Post 2	n	Z	p-value
Median	4.5	2.5				3	1.50			
Maximum	13	9	12	3.11	0.002	9	7	12	2.87	0.004
Minimum	1	0				0	0			

Pre 1= Number of pre-articulation defects in the main speech camp

Post 1 = Number of post-articulation defects in the main speech camp

Pre 2= Number of pre-articulation defects in a followed up speech camp

Post 2 = Number of post-articulation defects in a followed up speech camp

where there is a lack of professionals and services. Even though the duration of the speech camp was very short (four days), its success was comparable to recent speech camps that lasted two or three weeks [26]. This study indicates that a speech camp as described above, would serve as an excellent national project.

Fortunately, in 2007, the National Health Security Office, Ministry of Public Health, Thai Speech and Hearing Association, and the Thai Red Cross Society realized the magnitude of speech and language problems in cleft lip and/or cleft palate. Together they raised funds to help people with cleft lip and/or cleft palate to get services via the “Smart Smile & Speech” project as a celebration of the 50th birthday of Her Royal Princess Sirinthorn. This program funded paraprofessional training in this specific area in Thailand. However, establishing an education center to produce qualified speech and language pathologist would also be beneficial for helping to solve this long lasting problem. Providing well-trained professionals in the health care units and gaining government support are challenging steps for the policy of this developing country.

Conclusion

Intensive, short-term, Community-Based Speech therapy is a model that provides effective benefits for children with cleft lip and/or palate. It should be extended to other areas in Thailand and applied to developing countries where speech therapy services are limited or not available.

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