The Use of Music Activities in Reducing Cluttering in Children with Speech Flow Disorder

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Abstract

The objectives of this research were to 1) design music activities to reduce cluttering in children with speech flow disorder and 2) to study the outcomes of the music activities so applied. The sample group consisted of five children who are six to eight years old and diagnosed with speech flow disorder by a doctor with assessment of speech development by a teacher. Tools used to collect data for this research included nine lesson plans of music activities to reduce cluttering in children with speech flow disorder and six tests of speaking skills. The data was statistically analyzed using mean, standard deviation, and t-test for correlated samples.

The results revealed that:

1) The nine lesson plans of music activities to reduce cluttering in children with speech flow disorder require 270 minutes to carry out and had an average efficiency of 4.69, which translates to being very suitable. The six tests were evaluated to be suitable.

2) By comparing the outcomes before and after the music activities, it was found that the average score before the music activities was 9.20, suggesting a low level of speaking skill, whereas the average score after the activities was 20.00, suggesting an intermediate level of speaking skills. The post-activities score was higher than the pre-activity score with a statistical significance of .05.

Keywords: music activities, speech cluttering, children with speech flow disorder

1. Introduction

Music is well recognized among academics as a discipline whose contribution to the human knowledge is tremendous. Despite being in the field of humanity, this form of expressive performance has made several valuable interdisciplinary impacts whether in aesthetics, education, or developmental science.

Using music to foster human developmental progress is a process that applies music-related knowledge to intervene, improve, and maintain physical, mental, emotional, social, and intellectual wellbeing. These goals are achieved through a series of carefully structured music activities whose working principles are scientifically informed. Thus, the goals of such intervention is not about musical excellence. Instead, it emphasizes physical, mental, emotional, social, and intellectual wellbeing, all of which can be applied to a wide age group and cover various developmental issues depending on individual necessity (Siriratrekha 2010). This also includes those with special needs.

Music for children with special needs is an activity that must be specifically tailored in ways that differ from similar activities for normal children. This is because those with special needs have different and various learning capabilities from those without special needs and even among themselves. “Children with speech disorders” refers to a child who has difficulties forming speech sounds for communicating with others. Because speaking is the first method of communication used by an infant to interact with people around them, checking speech development and language skills in the child’s first five year is crucial for parents, doctors, and health experts. This is to evaluate and plan for a timely intervention should a sign of disorder is detected. If such problems are not treated, a child may develop apraxia of speech which impedes the muscular ability to generate speech. Depending on the severity, apraxia of speech can limit or prohibits verbal communication. Another disorder that may arise is a motor difficulty to coordinate word sounds and syllables (NIDCD 2017). These disorders can, if not treated, obstruct a child’s daily life in a long run. These issues are by no means new, and several countries have initiated programs to combat this developmental problem as early as late 70s. For example, a collaborative research between Swedish Institute for the Handicapped with the International Commission on Technical Aids, Housing and Transportation was launched to improve communication skills, treating speech disorder, and rehabilitating speech capability in a child (Lundman et al 1978).

In Thailand, the list of disabilities in Thailand provided by the Ministry of Social Development and Human Security (2020) shows that those with speech disorder is ranked second, constituting 18.82 percent of those with a disorder. Speech disorders in Thai children and youth are mostly about difficulty in articulating word sounds and controlling speech flows. The speech disorders can be categorized into three types:

1) Articulator disorders – this includes absence of a certain sound in a word such as “*kham*” instead of “*khwam*” (a Thai suffix to make a gerund) mispronouncing a consonant such as “*chin*” instead of “*kin*” (to eat), adding extra sounds such as “*hok-ka-lom*” instead of “*hok-lom*” (to tip over), and deviating intonation such as “*laew*” with a low intonation instead of “*laew*” with a rising intonation. However, the regularity or occurrence as well as the speaker’s cultural context must be taken into consideration. It is not considered a speech

disorder if a speaker does not demonstrate these symptoms on a regular basis or if a speaker's native language is different from the Central Thai language. For example, a Southern Thai dialect for jellyfish is "*maengphun*" as opposed to Central Thai's "*maengkaphrun.*"

2) Voice disorders are conditions in which an individual speaks, for example, constantly in either unusually high or low pitch, in monotone, in either too loud or soft volume, or has a coarse vocal tone.
3) Speech flow disorder – these include nonsequential and grammatically incorrect speech, incorrect speech pauses, too fast or too slow speech pace, abnormal speech rhythm, and discontinuous speech flow. Stuttering and cluttering are the most common symptoms of speech flow disorder. Stuttering refers to a condition in which an individual says a word of parts of a word multiple times and has difficulty speaking in a fluid manner. Cluttering is when a person speaks fast and jam words together or misplaces words or syllables in a word (NECTEC 2005).

Speech cluttering is a condition of speech flow disorder where a speech is delivered in too fast a pace, has inaccurate intonations or inflections, or contains grammatical errors. If left unattended, the condition can affect a child's developmental progress. Children with speech cluttering will usually shy away from making verbal communication in fear of being harassed. Stuttering and cluttering can lead to a struggle in socialization. Based on primary school teachers' interview, it found that the number of children with speech problems, especially speaking fast has increased. This affects their learning as well as other classmates.

If treated in early in the childhood, speech cluttering can be drastically reduced. One of the most effective means to diagnose and correct such condition is music, since it aids in aligning spoken words to musical sounds. Treating speech problems via musical instruments must be tailored toward an individual needs to encourage a child to do their best and to successfully overcome speech disorder (Kamnoedpet 1993). Additionally, using music and singing to, for example, assist in pronunciation and speech intonation along with melodic scale is advantageous as a child can have fun without feeling being under a therapy (Sutthachit 1998: 66). Just as melodic movements along a scale can be similar to spoken words, musical rhythms can help to control breathing, speech pauses, and word choices. Nonetheless, using music to reduce speech disorder must take into account individual factors affecting a child's conditions for an optimum therapeutic result.

From the background and issues stated above, I am interested in creating music activities to reduce cluttering in children with speech flow disorder. The music activities, designed specifically for children experiencing conditions related to speech cluttering, can consequentially pave the way for further planning for developing a child's language and communication as well as other developmental aspects. This is to prepare a child to live socially well with others.

2. Research Methodology

The population and sample group in this research were determined as follow:

Population

The population in this research are children with speech flow disorder. It is selected from the results of the speech development assessment by teachers and the diagnosis by the doctor.

Sample Group

The sample group in this research consisted of five children aged six to eight years old with speech flow disorder, particularly speech cluttering. The sample group had no conditions related misophonia. It is selected from the results of the speech development assessment by teachers and the diagnosis by the doctor.

Research Variables

Independent variable is music activities.

Dependent variable is cluttering in children with speech flow disorder.

Research Tools

1. A set of lesson plan of music activities to reduce cluttering in children with speech flow disorder.
2. Test of speaking skills for the children with speech flow disorder

Construction of Research Tools and Content Validation

Lesson plans of music activities to reduce cluttering in children with speech flow disorder

1. Reviewing literature related to speech development in children, children with speech disorders, speech therapy, music activities, lesson plans, and music elements.
2. Constructing lesson plans by applying results from two research works: "Developing a Model for Correcting Articulation Disorders in Children with Mild Intellectual Disabilities by AES2D Approach" by Bunthita Likkhasit and Daranee Saksiriphol (2017: 17-30) and "Variable Practice to Enhance Speech Learning in Ultrasound Biofeedback Treatment for Childhood Apraxia of Speech: A Single Case Experimental Study" by Jonathan L. Preston, Megan C. Leece, Kerry McNamara, and Edwin Maas (2017). The result was nine lesson plans to reduce cluttering in children with speech flow disorder that emphasize on speech pacing and organization.
3. The content of the developed lesson plans was then validated by three specialists who are experienced at least 10 years in music, music activities for children with speech cluttering, and in teaching Thai language in primary school. The specialists provided comments and suggestion to the lesson plans.
4. Revising the lesson plans, which was created by the researcher and validated by the experts before subjecting to a try-out session with a mock sample group consisting of children with speech pacing and organization.
5. Determining the reliability score of the developed lesson plans.
6. Making final revisions to the developed lesson plans before introducing it to the sample group.

Test of speaking skills for the children with speech flow disorder

1. Reviewing literature related to speech development in children, children with speech disorders, speech therapy, music activities, lesson plans, and music elements.
2. Constructing a test for speaking skills. The test consists of two parts: speech pacing skills and speech organization skills. The test consists of six questions, each requiring the children to exhibit their speech capability.

3. Three specialists who are experienced in music, music activities for children with speech cluttering, and in teaching Thai language in primary school inspected the content of the developed test to determine an index of item objective congruence or IOC. The IOC of the developed test was above 0.50.
4. Revising the test before subjecting it to a try-out session with a mock sample group consisting of children with speech pacing and organization problems.
5. Determining the reliability score of the developed test.
6. Making final revisions to the developed test before introducing it to the sample group.

These 9 sessions spent 30 minutes each for three weeks on Tuesdays, Wednesday and Thursday.

Experiment Scheme

Since this is an experimental research, I conducted the study following a one-group pretest-posttest design, as illustrated below:

Table 1 : Experiment scheme

Pretest	Activities	Posttest
O_1	→ X →	O_2

Where:

O_1 stands for pre-music activities test
X stands for the music activities
O_2 stands for post-music activities test

During the experimental period, I, the researcher, and a research assistant used the nine developed lesson plans for a period of three weeks on Tuesdays, Wednesdays, and Thursdays, totaling 9 sessions of 30 minutes each. Set the frequency of the day according to the continuation of the activity training.

3. Results

After nine sessions of the lesson plans of music activities to reduce cluttering in children with speech flow disorder, the results were as follows:

Part 1: results of the music activities to reduce cluttering in children with speech flows disorder

From the examination and analysis of the information related to this study, nine lesson plans of music activities to reduce cluttering in children with speech flow disorder were constructed. Also created was the six-question test for the speech pacing and speech organization. Each of the nine lesson plans requires 30 minutes to complete, giving a total of 270 minutes for the entire lesson plans. The average efficiency score of the tool was 4.69, which translates to being very suitable.

Table 2 : Lesson plans of music activities to reduce cluttering in children with speech flow disorder.

Learning Activities	Time (minutes)	speech spacing skills	speech organization skills
Activity 1 The relationship between music and human senses	30	/	/
Activity 2 Music and Breathing	30	/	/
Activity 3 Speech articulation	30	/	/
Activity 4 Mouth positioning during speech	30	/	/
Activity 5 High and low pitches	30	/	/
Activity 6 Loud and soft sound	30	/	/
Activity 7 Stressing	30	/	/
Activity 8 Pausing and speech pacing	30	/	/
Activity 9 Speech organization	30	/	/

Table 3 : Efficiency rating of the lesson plans of music activities to reduce cluttering in children with speech flow disorder.

No.	Efficiency Criteria	Evaluation	
		Average	Interpretation
1	Elements necessary for a lesson plan are included.	5.00	Extremely suitable
2	The lesson plans correspond with the research topics	4.67	Very suitable
3	Learning outcomes covers the content materials	4.67	Very suitable
4	The content materials are developmentally suitable with the sample group	4.67	Very suitable
5	The breadth and depth of the content materials is appropriate with the time needed	4.33	Very suitable
6	The learning activities are carried in an appropriate order	5.00	Extremely suitable
7	The learning activities are varied and practical	4.67	Extremely suitable
8	The learning activities can solve, promote, and improve speaking skills	4.33	Very suitable
9	The learning activities stimulates thinking process	4.33	Very suitable
10	The content materials are relatable to everyday life	4.67	Extremely suitable
11	Learning media and resources are diverse	4.67	Extremely suitable
12	Learning media and resources correspond with the content materials as well as the learning activities	5.00	Extremely suitable

13	The sample group have equal opportunity to use learning media and resources.	4.67	Extremely suitable
14	The sample group are allowed to express their own opinions during the activities	4.67	Extremely suitable
15	Assessment and evaluation comply with the learning objectives	5.00	Extremely suitable
Total		**4.69**	**Extremely suitable**

Tables 2 and 3 show the construction and the evaluation of the nine developed lesson plans. By using the form of music activities such as clapping hands, body movement playing musical instruments, breathing, speaking, and playing with the rhythm of the music, and lip-shaping, singing, emphasis on words at high pitch. low tone of music. Musical instruments used include Tambourine, Anglung, drum. And the songs used are Cĥāng song, Tèā ngū læa kā song, Kx p̄hị̀ song, X́a X́a Xỳā thîng k̄hya song. According to the efficiency evaluation rated by the three specialists, the average score was 4.69. The score meant that the developed lesson plans were extremely suitable and introduced to the sample group.

Table 4 : Efficiency rating of the tests of speaking skills for the children with speech flow disorder.

Objectives	**No.**	**Item-Objective Congruence**			**IOC rating**	**Interpretation**
		Specialist 1	**Specialist 2**	**Specialist 3**		
Speech pacing skills	1	+1	+1	+1	1.00	Suitable
	2	+1	+1	+1	1.00	Suitable
	3	+1	+1	+1	1.00	Suitable
Speech organization	1	+1	+1	+1	1.00	Suitable
	2	+1	0	+1	0.66	Suitable
	3	+1	+1	+1	1.00	Suitable

Table 4 shows the efficiency evaluation of the tests of speaking skills for the children with speech disorders, rated by three specialists. All the tests questions were suitable for assessing and evaluating the children with the speech flows disorders, particularly speech pacing and organization.

Part 2: Comparison of learning outcomes before and after implementing the lesson plans of music activities to reduce cluttering in children with speech flow disorder, both in whole and in part, by using arithmetic mean $(\overline{X})$ and standard deviation (S.D)

Table 5 : Pre- and post-activity scores of the sample group, sorted individually.

N	Pre-activity	Post-activity
	Score (out of 30)	Score (out of 30)
1	9.50	20.50
2	6.00	17.50
3	13.50	25.50
4	10.50	21.50
5	4.50	12.50
Mean	9.20	20.00
Standard Deviation	3.701	4.848

According to the data shown in Table 5, the sample group in this study consisted of five children. The pre-activity scores, in descending order, were 13.50 by child 3, 10.50 by child 4, 9.50 by child 1, 6.00 by child 2, and 4.50 by child 5. The average of the pre-activity score was be 9.20, which translates to a low level of speaking skills with a standard deviation of 3.701. The average post-activity score was 20.00, which translates to an intermediate level of speaking skills with a standard deviation of 4.848. When considered individually, children 1, 3, and 4 had a slightly higher level of speaking skills. When comparing the pre- and post-activity scores both individually and collectively, the post-activity score is higher than the pre-activity score. This concurs with the research hypothesis that the children with speech flow disorder had a lower rate of cluttering after receiving the music activities.

Table 6 : Arithmetic mean, standard deviation, t-test, and statistical significance of the test results before and after the use of music activities to reduce speech cluttering in children with speech flow disorder.

Sample Group	N	Mean (Out of 30)	Standard Deviation	Mean Difference	Deviation Difference	T	p
Pre-activity	5	9.2	3.701	10.800	1.643	-14.697*	.000
Post-activity	5	20	4.848				

*p<.05, df = 4

As seen from table 6, the sample group's score of the pre-activity test of speaking skills was 9.20, which translates to a low level of speaking skills. The collective mean score of the post-activity test of speaking skills was 20.00, which translates to an intermediate level of speaking skills. The difference between the pre- and post-activity mean scores was 10.80, while the standard deviation of the difference between the mean scores was 1.643. Comparing the test scores from the two occasions, the post-activity score was higher than the pre-activity score. This concurs with the research hypothesis that the children with speech flow disorder had a lower rate of cluttering after receiving the music activities.

Table 7 : Arithmetic mean, standard deviation, t-test, and statistical significance of speech pacing before and after the use of music activities to reduce speech cluttering in children with speech flow disorder.

Sample Group	N	Mean (Out of 30)	Standard Deviation	Mean Difference	Deviation Difference	T	p
Pre-activity	5	5.30	2.110	5.300	.837	-14.165*	.000
Post-activity	5	10.60	2.191				

*p<.05, df = 4

As seen from table 7, the sample group's score of speech pacing in the pre-activity test of speaking skills was 5.30, which translates to an intermediate level of speaking skills. The mean score of the post-activity test of speech pacing was 10.60, which translates to a high level of speaking skills. The difference between the pre- and post-activity mean scores was 5.30, while the standard deviation of the difference between the mean scores was 0.837. Comparing the test scores from the two occasions, the post-activity score was higher than the pre-activity score with a statistical significance of 0.05.

Table 8 : Arithmetic mean, standard deviation, t-test, and statistical significance of speech organization before and after the use of music activities to reduce speech cluttering in children with speech flow disorder.

Sample Group	N	Mean (Out of 30)	Standard Deviation	Mean Difference	Deviation Difference	T	p
Pre-activity	5	3.8	2.168	5.600	1.140	-10.983*	.000
Post-activity	5	9.4	2.881				

As seen from table 8, the sample group's score of speech organization in the pre-activity test of speaking skills was 3.80, which translates to an intermediate level of speaking skills. The mean score of the post-activity test of speech pacing was 9.40, which translates to a high level of speaking skills. The difference between the pre- and post-activity mean scores was 5.60, while the standard deviation of the difference between the mean scores was 1.140. Comparing the test scores from the two occasions, the post-activity score was higher than the pre-activity score with a statistical significance of 0.05.

4. Discussion and Conclusion

Conclusion

After implementing the music activities to reduce cluttering in children with speech flow disorder, the study can be concluded as follows:

1. Nine lesson plans of music activities to reduce cluttering in children with speech flow disorder were developed. The total time needed to cover the entire lesson plans was 270 minutes, with thirty minutes allocated to each lesson:

Activity 1 The relationship between music and human senses
Activity 2 Music and Breathing
Activity 3 Speech articulation
Activity 4 Mouth positioning during speech
Activity 5 High and low pitches
Activity 6 Loud and soft sound
Activity 7 Stressing
Activity 8 Pausing and speech pacing
Activity 9 Speech organization

From the evaluation provided by three specialists, the lesson plans' average efficiency score was 4.69, which translates to being extremely suitable.

Additionally, I have constructed a set of tests to be taken by the sample group before and after the music activities. The test consisted of six questions, three of which involves speech pacing while the other three are about speech organization. All the six questions have been evaluated as suitable by the three specialists.

2. Comparing the initial speaking skills and the learning outcomes after the music activities, the pre-activity mean score of the speaking skills of the sample group was 9.20, which means a low level of speaking skills. The post-activity mean score of the speaking skills of the sample group was 20.00, which translates to an intermediate level of speaking skills. The difference between the pre- and post-activity mean scores was 10.800 while the standard deviation of the difference was 1.643. Comparing the tests scores before and after the music activities, the post-activity score was higher than the pre-activity score with a statistical significance of .05.

Results Discussion

After presenting the research results above, I now discuss the findings below.

1. The efficiency score of the developed lesson plan of music activities to reduce cluttering in children with speech flow disorder, as evaluated by the three specialists, was 4.69. This rating puts the lesson plans in the most suitable position to be implemented for improving children's speaking skills. This is because the content materials of the lesson plans were based on Bunthita Likkhasit and Daranee Saksiriphol's work "Developing a Model for Correcting Articulation Disorders in Children with Mild Intellectual Disabilities by AES2D Approach" (2017: 17-30). Similarly, the work by Jonathan L. Preston, Megan C. Leece, Kerry McNamara, and Edwin Maas "Variable Practice to Enhance Speech Learning in Ultrasound Biofeedback Treatment for Childhood Apraxia of Speech: A Single Case Experimental Study" (2017) paved the way for determining time-per-activity ratio, knowledge on child speech development, speech disorder conditions in children, and music activities. Regarding the construction of the research tools, I strictly followed the standardized measures toward writing a lesson plan. This includes studying the methods to writing a lesson plan, analysis of content materials as well as the students, ensuring the parallel between content materials and learning outcomes, planning out the learning activities, determining learning media and resources, and creating an evaluation scheme that is developmentally appropriate to the students. The constructed lesson plans were then subjected to an inspection by three specialists, who kindly provided useful suggestions and comments that resulted in the finalized version. These steps amounted to the high efficiency rating of the lesson plans. Burachai Sirimahasakhaun states that a good lesson plan must constitute 1) the knowledge that is to be produced or objectives, 2) the teaching to accomplish the set objectives or the learning itself, 3) the assessment and evaluation to check whether a student have achieved the established learning objectives (2002: 5). This lesson plan capitalizes on the potential of music to correct cluttering in children with speech flow disorder. Since music, particularly singing and playing instruments, shares similar characteristics with language in terms of articulation, pitch, and rhythm, understanding it can be an entry point to a better grasp in speaking and therefore language usage. Besides, the efficiency and productivity of this lesson plan has been verified; it can be applied as a model for other child development projects and for other topics in music subject.

2. From the comparison between the pre- and post- activity results, it was found that the average score of speaking skills – both speech pacing and organization – of the sample group was 9.20, a low level of speaking skills. However, the same average score, taken after receiving the lesson plan, was 20.00, indicating an intermediate level of speaking skills. The difference between

the two average scores was 10.800 while the standard deviation was 1.643. Thus, the comparison between the pre- and post-activity scores revealed that the music activities can reduce cluttering in children with speech flows disorders with the statistical significance of .05. To put it descriptively, music activities can effectively and efficiently reduce such conditions This is because the implemented elements like melody, rhythm, tone color, singing, playing instruments, listening, movement, and reading are designed to reflect human speech. The "fun factors" from music-making also stimulated the sample group toward improving speech skills, while making them feel as though they were not under a therapy or experimental session. When they were engaged willingly and repetitively, the result was noticeably better speech skills demonstrated in the given time period by the sample group. Chaiwat Sutthirat comments that music is important to the mind of the listeners in that it entertains and relaxes them, creating an emotional pleasure and playing a crucial role in one's life (2015: 433). Several educators have turned to use music as both main and supplementary tool for educational interventions for the following reasons: music uplifts atmosphere in a classroom and soothes the students' minds, 2) music promotes one's creativity, personality, and sociality, 3) Music helps to reiterate past lessons, for example, vocabulary, sentences, grammar, slangs, and idioms, all of which can be found in daily conversation, 4) Music improves language through comprehensive listening as well as pronunciation and articulation during singing, providing students a sense of pride when they successfully perform and creating positive attitude towards learning, and 5) Music educates students with wide range of other topics, including cultures, and important places and days; song and song texts can be both means and materials for this purpose.

The above discussion suffices to confirm the efficiency and effectiveness of music activities in reducing cluttering in children with speech flow disorder with a tangible result. It also demonstrates that music-related knowledge can serve to improve speech development in a child. It is my intention that this research expands the knowledge base of music especially its applicability to assist those with special needs. There are currently little works in this area in Asia, let alone Thailand. As such, this research, it is hoped, can perhaps provide a model to further develop similar projects that apply music knowledge, that implement music-related content to assist special need children, or that seek other art forms to benefit those on the receiving ends beyond just aesthetics.

5. References

Burachai Sirimahasakhaun (2002). *A student-centered lesson plan.* 1st print. Bangkok: bookpoint.

Chaiwat Sutthirat (2015). *Innovative learning management that focuses on learners.* 6th printing. Nonthaburi: P Balans Design and Printing.

Kamnoedphet, P. (1993), *Kaan chat kaan baurihaan kaan sueksaa khaung bukkhon panyaa aun: Kaan rian ruam rawaang dek thee mee khwaam bokphraung thaang sati panya kap dek pakati [Servicing education for the mentally retarded: Inclusive classroom between children with mentail disability and normal children*. Rajanukul Hospital.

Likkasit, B., & Saksiriphol, D. (2017), Developing a Model for Correcting Articulation Disorders in Children with Mild Intellectual Disabilities by Aes2d Approach. *Journal of Education, 21*(2), 17–30.

Lundman, M. (1978), *Technical Aids for the Speech-Impaired—Proposal for Research and Development Activities*. International Commission on Technical Aids, Housing and Transportation, Bromma, Sweden. https://eric.ed.gov/?id=ED173987

NECTEC. (2015), *Bukkhon thee mee khwaam bok phraung thaang kaang phuut [individuals with speech disorders]*. http://www.nkw.ac.th/courseware/www.nectec.or.th/courseware/special-edu/0019.html

Preston, J. L., Leece, M. C., McNamara, K., & Maas, E. (2017), Variable Practice to Enhance Speech Learning in Ultrasound Biofeedback Treatment for Childhood Apraxia of Speech: A Single Case Experimental Study. *American Journal of Speech-Language Pathology*, *26*(3), 840–852. https://doi.org/10.1044/2017_AJSLP-16-0155

Samrongthong, B. (2001), *Final Research Report on Music Therapy Project: Thai Traditional Music as a Means of Therapy using Akaboshi's Principles of Music Therapy*.

Siriratrekha, T. (2020), Music Therapy. *Music Therapy*. https://www.happyhomeclinic.com/a06-musictherapy.htm

Sutthachit, N. (1998), *Chit wittayaa kaan saun dontrii [psychology for music education]*. Chulalongkorn University Press.

Thai Alternative Medicine Office. (2008), *Music Therapy*. Thailand.

The National Institute on Deafness and Other Communication Disorders (NIDCD). (2017), *Speech and Language Developmental Milestones*. https://www.nidcd.nih.gov/health/speech-and-language