

Study of Remedial Teaching for Reading and Writing Skills in Grade 4 to 9 Students with Cleft Lip/Palate and Reading Disabilities

Chaluntorn Worawattanatrakul BA¹, Pattaramon Wijakkanalan MD², Benjamas Prathanee PhD²

¹ Curriculum and Instruction in Special Education, Faculty of Education, Khon Kaen University, Khon Kaen, Thailand

² Department of Otorhinolaryngology, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand

Objective: The aim was to follow-up the 1-year rate of reading disabilities among students with CLP and reading disability, Grade 4 to 9, explore writing disabilities compare the pre- and post-reading and writing scores after providing learning exercises.

Materials and Methods: Participants were ten selected students with CLP and reading disability, in Grades 4 to 9. After performing standard reading and writing tests, exercises for promotion of reading and writing skills were applied. Teachers who teach Thai were trained in teaching learning exercises for promoting reading and writing. Students in Grades 4 to 6 were then taught 28 sessions and those in Grades 7 to 9 were taught 20 sessions (30 to 45 minute/session, 4 sessions/week). Descriptive analysis and a comparison pre- and post-test for reading and writing skills were scored using the Wilcoxon Signed rank Test.

Results: Percentage of 1-year follow-up reading disabilities among students with CLP and reading disabilities, Grade 4 to 6 was 5 of 30 (16.66%) and Grade 7 to 9 was 4 of 30 (13.33%). After promoting remedial teaching for 6 weeks, medians of reading and writing scores significantly increased [Reading score: mean difference [MD] = 13.00, 95% confidence interval [CI] = 5.00 to 13.00 and MD = 8.46, 95% CI = 6.50 to 13.86; Writing score: MD = 14.50, 95% CI = 6.00 to 14.50 and MD = 11.00, 95% CI = 9.99 to 16.67 respectively]. Percentage of reading disabilities in students with CLP and reading disabilities, Grade 4 to 6 decreased to be 3.33% and students, Grade 7 to 9 decreased 6.66%.

Conclusion: Rate of 1-year follow-up reading and writing disabilities in students with CLP with reading disabilities, Grade 4 to 9 remained high albeit learning exercises improved reading and writing skills.

Keywords: Reading disabilities, Writing disabilities, Cleft lip and palate, Cleft palate, Remedial teaching

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Compensatory articulation disorders [CAD] and functional articulation disorders are common communication defects among persons with cleft lip/palate [CLP]⁽¹⁾ because of a failure in normal articulation due to both velopharyngeal insufficiency and functional misarticulation, which in turn result in deficiencies oral reading⁽¹⁾.

Correspondence to:

Prathanee B, Department of Otorhinolaryngology, Faculty of Medicine, Khon Kaen University, Khon Kaen 40002, Thailand.
Phone: +66-43-348396, **Fax:** +66-43-202490
E-mail: bprathanee@gmail.com

Finland had the greatest literacy among normal students (2015): the respective prevalence of reading and writing problems being 1.15% and 2.14%. In Japan, the respective prevalence of reading and writing problems was 2.23% and 3.09%⁽²⁾. By comparison, in Thailand, the respective prevalence of oral reading problems among students with CLP in Grades 3 to 5⁽³⁾ vs. Grades 6 to 8⁽⁴⁾ was 16.66%. The comparable respective rates for reading, writing, and reading & writing problems among normal students in Grade 4 in 2016 vs. 2017 was 4.41%, 11.33%, and 5.36% vs. 8.17% and 13.28%⁽⁵⁾.

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The criteria for diagnosing reading and writing disabilities are based on the Office of Basic Education and include failure in reading and writing skills (a test score under 50%). Reading tests include oral reading (words singly and paragraphs). Writing tests include spelling words (singly) and dictation (words singly and paragraphs). The objectives of the current study were to (a) follow-up on reading abilities among students in Grades 4 to 9 with CLP having a reading disability^(3,4); (b) explore writing disabilities; and, (c) compare the pre- and post-scores of reading and writing skills after providing learning exercises for promoting reading and writing skills.

Materials and Methods

A prospective cohort study was conducted. Participants comprised 10 selected students with CLP from 2 previous studies with 60 students who had reading disabilities (5 from each of Grades 4 to 6: $n = 30$; and Grades 7 to 9: $n = 30$)^(3,4). The study protocol was approved by Khon Kaen University Ethics Committee for Human Research (HE601110).

Setting

Speech Clinic, Srinagarind Hospital and the lecture room at the Faculty of Education, Khon Kaen University, Thailand.

Materials used included

1) Standard reading and writing tests for Grades 4 to 6 are developed by Sakaeo Primary Education Service Area 2 of the Office of the Basic Education Commission⁽⁶⁾. Reading tests include oral reading (words singly and paragraphs); writing tests include spelling and dictation (words singly and paragraphs). The criterion for failure for both reading and writing skills is $<50\%$ ⁽⁶⁾.

2) Standard reading and writing tests for Grades 7 to 9 were developed by Sakaeo Secondary Education Service Area 7, Basic Education Commission⁽⁷⁾. Reading tests included oral reading (words singly and paragraph), while writing tests included spelling and dictation (words singly and paragraphs). The respective criteria of failure for the reading and writing skills is $<60\%$ ⁽⁷⁾ and $<50\%$ ⁽⁷⁾.

3) Learning exercises for promoting reading and writing skills were constructed by the researchers, based on guidelines for solving articulation defects⁽⁸⁾. Vocabulary for Grades 4 to 9 were reviewed and list created⁽⁹⁾. The list was presented to a Thai subject specialist and an index of item objective congruence

[IOC] and content validity were established. Retained items had an IOC $>0.80\%$ ⁽¹⁰⁾. Learning exercises were trialed with 5 CLP students not in the study group. The Cronbach's alpha coefficient was 0.80, implying that the learning exercise was valid.

Students with CLP and a reading disability were assessed for reading and writing skills^(6,7). Learning exercises were provided by teachers who regularly teach the Thai subject in local schools. A respective teaching program of 28 and 20 sessions was scheduled for students in Grades 4 to 6 and 7 to 9. Each session was 30 to 45 minutes. Four sessions/week were provided within 6 weeks. Reading and writing skills were reassessed after the learning exercises. The results were presented using descriptive statistics and a comparison of the pre- and post-test median scores using the Wilcoxon Signed rank Test.

Results

Students with general characteristics of CLP were identified from the medical records of Srinagarind Hospital (Table 1). The pre- and post-test vis-a-vis the reading and writing score are presented in Table 2.

This study presented 16.66% of students with CLP (5 of total 30 students with CLP), Grades 4 to 6 still had reading disabilities after 1 year-follow-up. Eighty percent (4 of 5 students with CLP who had reading disabilities) had also writing disabilities. After application of reading and writing promotion program for 5 students, the rate of reading disabilities decreased to be 3.33% (1 of total 30 students with CLP), and reading scores increased to be 10.92%. The rate of writing disabilities decreased to be 20.00% (1 of 5 students with CLP who had reading disabilities). Writing scores increased to be 11.50% (Table 2).

Results presented 13.33% of students with CLP (4 of total 30 students with CLP), Grades 7 to 9 still had reading disabilities after 1 year-follow-up. Among these, 40.00% (2 of 4 students with CLP who had reading disabilities) had also writing disabilities. After application of reading and writing promotion program for 5 students, the rate of reading disabilities decreased to be 6.66% (2 of total 30 students with CLP), and reading scores increased to be 10.09%. The rate of writing disabilities decreased to be 20.00% (1 of 5 students with CLP who had reading disabilities). Writing scores increased to be 13.00% (Table 2).

The Wilcoxon Signed Rank Test was significantly increased when comparing pre- and post-scores after promotion of reading and writing program (Table 4).

Table 1. Characteristics of students with cleft palate, Grades 4 to 9

No.	Age	Grade	Sex		Diagnosis
			Boy	Girl	
S1	10	4	✓		N/A*
S2	10	4	✓		Delayed speech and Language, Learning Disability, ADHD
S3	9	4		✓	Delayed speech and Language
S4	11	5	✓		Delayed speech and Language
S5	12	6	✓		N/A*
M6	13	7	✓		Delayed speech and Language
M7	14	7	✓		Delayed speech and Language
M8	14	8		✓	Delayed speech and Language
M9	14	9	✓		Delayed speech and Language
M10	15	9	✓		Delayed speech and Language

S = Students in Grade 4 to 6; M = Students in Grade 7 to 9; N/A* = not available

Table 2. Reading and writing score of students with cleft palate, Grades 4 to 9

No.	Reading (%)		Writing (%)	
	Pre-test	Post-test	Pre-test	Post-test
S1	54.00	67.00	38.50	53.00
S2	37.00	48.00	26.00	37.00
S3	57.00	68.00	46.50	59.50
S4	48.00	53.00	37.50	50.50
S5	58.00	69.00	56.00	62.00
Average score	50.08	61.00	40.90	52.40
Score increase	10.92		11.50	
M6	59.27	70.56	55.00	65.00
M7	72.38	86.24	70.00	86.67
M8	52.01	60.47	48.33	63.33
M9	42.54	49.05	80.00	93.33
M10	39.92	50.68	31.67	41.67
Average score	53.31	63.40	57.00	70.00
Score increase	10.09		13.00	

S = Students in Grade 4 to 6; M = Students in Grade 7 to 9

Discussion

The current study focused on incorrect reading and writing disabilities. The study revealed the reading disability rate at the 1-year follow-up based on criteria set out by the Office of the Basic Education. The respective proportion of students with CLP having a reading disability in Grades 4 to 6 and 7 to 9 was 16.66% and 13.33%. Reading skill did improve reading with regular in school learning and direct support. The rate of writing disabilities ranged between 40 and 80%;

underscoring that writing disability is common among students with a reading disability⁽¹¹⁾. Students with a reading disability commonly had a learning disability and ADHD, which typically has an impact on reading skills and might impact further educational achievement^(11,12).

Regarding Thai language skills, word clusters were the most common problem vis-a-vis reading disabilities (63%). This is similar to previous studies^(2,3) among normal students⁽¹¹⁾. In consonant clusters,

Table 3. Incorrect reading based on Thai language skills

Category	Students in grade 4 to 6		Students in grade 7 to 9	
	Reading problem order	Writing problem order	Reading problem order	Writing problem order
Words with consonant clusters	1	2	4	1
Words without final consonant	2	3	5	2
Words with regular final consonants	3	4	6	3
Words with irregular final consonants	4	5	7	4
Words with inherent vowel	5	1	3	5
Words with vowel change	6	6	1	6
Words without spelling consonant	7	7	2	7
Words with tones	8	8	3	8
Words with silent consonants	9	9	9	9

Table 4. Comparison pre- and post-test of reading and writing scores

Grade 4 to 6	Pre-test		Post-test		Z	p-value	MD [#]	95% CI ^{##}
	Med*	SD**	Med	SD				
Reading	54.00	8.64	67.00	9.77	-2.06	0.04	13.00	5.00 to 13.00
Writing	38.50	10.66	53.00	11.48	-2.04	0.04	14.50	6.00 to 14.50
Grade 7 to 9	Pre-test		Post-test		Z	p-value	MD [#]	95% CI ^{##}
	Med*	SD**	Med	SD				
Reading	52.01	12.97	60.47	14.45	-2.03	0.043	8.46	6.50 to 13.86
Writing	55.00	13.67	65.00	16.24	-2.04	0.041	11.00	9.99 to 16.67

*Med = median, **SD = standard deviation, [#]MD = median difference, ^{##}95% CI = 95% confidence interval

students with CLP more commonly substituted /l/ for /r/ than children without CLP⁽³⁾; this might explain the higher rate of cluster issues for children with CLP⁽¹³⁾.

The most common disabilities in writing skills are tone, cluster, and final consonants. This observation may be due to the fact that Thai (a tonal language) borrows words from Sanskrit and Pali (two non-tonal languages)⁽³⁾. Incorrect writing might also be the result of CAD or functional articulation disorders resulting in impairment structure of the soft palate and pharynx or velopharyngeal insufficiency after palate repair⁽¹⁴⁾. The relationship is that CAD or functional articulation disorders may originate from defects in the Broca's area and Wernicke's area⁽¹⁵⁾.

The rate of reading and writing disabilities at the 1-year follow-up revealed that the rates were similar to previous studies (viz., 16.66% vs. 16.66% for

students with CLP in Grades 4 to 6 and 16.66% vs. 13.33% for students with CLP Grades 7 to 9). After remedial teaching, average reading and writing scores were significantly increased and the rate of reading and writing disabilities decreased. Early detection and early intervention for children with CLP are necessary.

Students with CLP may also have learning disabilities related to conductive hearing loss from Eustachian tube dysfunction after palatoplasty, which can result in abnormalities in pressure adjustments in the middle ear. Moreover, liquid and bacteria in the pharynx and mouth can ascend to middle ear causing chronic otitis media⁽¹⁶⁾, causing fluctuations in hearing. If otitis media persists, hearing loss might cause speech defects, as well as problems with oral reading and spelling⁽¹⁷⁾. Further study is needed to determine the risk factor(s) for reading and writing disability as well

as to expand the sample size.

Conclusion

Students with CLP with reading disabilities had a persistently high rate of reading disability in the first year of follow-up. Having both a writing and a reading disability was a common problem among these students. Use of a remedial teaching program with supplementary learning exercises and an instructional package enhance reading and writing skills.

What is already known on this topic?

Students with CLP are at CAD and functional articulation defects are at risk of reading disabilities. An undiagnosed reading disability in CLP is cause for concern. Individual remedial programs for remedying reading disability among students with CLP are not available in Thailand.

What this study adds?

Students with CLP have persistent reading disabilities and risk for writing disabilities. Learning exercises enhance individual reading and writing scores, helping to compensate for CLP-induced disabilities.

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Potential conflicts of interest

The authors declare no conflicts of interest.

References

1. Bressmann T, Sader R. Speech rate in cleft lip and palate speakers with compensatory articulation. *Clin Linguist Phon* 2001;15:129-32.
2. Organisation for Economic Co-operation and Development (OECD). PISA 2015 results: excellence and equity in education, in series: PISA. Paris: OECD Publishing; 2016.
3. Ingkapak P, Prathanee B. Prevalence of oral reading problems in Thai students with cleft palate, Grades 3-5. *J Med Assoc Thai* 2016;99 Suppl 5:S9-14.
4. Chokbundit N, Pratahnee B. Oral reading problems in students with cleft palate, Grades 6-8. *J Med Assoc Thai* 2016;99 Suppl 5:S15-20.
5. Office of the Minister, Ministry of Education, Thailand. News of office of the minister 15/2017 [Internet]. 2017 [cited 2018 Mar 20]. Available from: <http://www.moe.go.th/moe/th/home/>.
6. Supervision and monitoring, Sa Kaeo Primary Education Service Area 2. The evaluate reading and writing skill, Grade 4-6 [Internet]. 2017 [cited 2017 Jun 20]. Available from: <http://www.primary2.go.th/doc/thai/testk4-6.pdf>.
7. Supervision and monitoring, Sakaeo Secondary Education Service Area 7. The reading and writing test, Grade 7-9 [Internet]. 2017 [cited 2017 June 20]. Available from: <http://www.secondary41.go.th/doc/thai/book1-4/book1m13.pdf>.
8. Prathanee B, Seephuaham C, Pumnum T. Articulation disorders and patterns in children with a cleft. *Asian Biomed* 2014;8:699-706.
9. Office of the Basic Education Commission. Handbook of vocabulary in Grade 4-9. Bangkok: Bureau of Education Testing, Office of the Basic Education Commission; 2013.
10. Thayraekum S. Principle of method research for humanities and social sciences. Kalasin: Prasan Publishing; 2009.
11. Sarnrattana U. Learning disabilities. Khon Kaen: Klang-nana Witthaya; 2007: Lesson 1: 14-15.
12. Richman LC, Eliason MJ, Lindgren SD. Reading disability in children with clefts. *Cleft Palate J* 1988;25:21-5.
13. Khuapinant C. Reading techniques. Bangkok: Silababannakarn; 1999.
14. Kummer AW. Velopharyngeal dysfunction (VPD) and resonance disorders. In: Kummer AW, editor. *Cleft palate and craniofacial anomalies: effects on speech and resonance*. 3rd ed. San Diego, CA: Singular Press; 2010. p. 145-76.
15. Guyton AC. The cerebral nervous system. In: Guyton AC, editor. *Basic neuroscience, anatomy and physiology*. Philadelphia: WB Saunders; 1991. p. 240-53.
16. Flynn T, Moller C, Jonsson R, Lohmander A. The high prevalence of otitis media with effusion in children with cleft lip and palate as compared to children without clefts. *Int J Pediatr Otorhinolaryngol* 2009;73:1441-6.
17. Rosenfeld RM, Schwartz SR, Pynnonen MA, Tunkel DE, Hussey HM, Fichera JS, et al. Clinical practice guideline: Tympanostomy tubes in children. *Otolaryngol Head Neck Surg* 2013;149(1 Suppl):S1-35.