Reading Problems and Risk of Dyslexia Among Early Elementary Students in Thailand

Tiraya Lerthattasilp[1]*, Paskorn Sritipsukho[2], and Issarapa Chunsuwan[3]

[1] Department of Psychiatry, Faculty of Medicine, Thammasat University, Thailand
[2] Center of Excellence in Applied Epidemiology, Thammasat University, Thailand
[3] Department of Pediatrics, Faculty of Medicine, Thammasat University, Thailand
* Tiraya Lerthattasilp, corresponding author. Email: clinictu@gmail.com
Submitted: 31 October 2021, Accepted: 1 April 2022, Published: 21 May 2022
Volume 30, 2022. pp. 726–740. http://doi.org/10.25133/JPSSv302022.040

Abstract

Reading problems and dyslexia adversely affect a child's learning, emotions, and behavior. This research aims to survey students with reading problems and at risk of dyslexia and find the relevant factors. This study considered students in the first grade of primary school. Eight schools in Pathum Thani province were selected by the purposive sampling method. Caregivers responded to questionnaires regarding information about their children and their family backgrounds. Research assistants tested the children's reading abilities with a reading ability assessment test. It was found that 161 of the 1,018 students are at-risk for dyslexia, with a calculated prevalence of 15.81% (95% CI, 13.63–18.20%). Following an analysis using the multivariable logistic regression model, it was found that the pertinent risk factors for reading problems in children were being male, a developmental or hereditary disease, a father with a low level of education, and type of school. Children with reading problems should receive the help they need early, while risk factors should be identified to improve the quality of education in different types of schools.

Keywords

Dyslexia; learning disorder; reading difficulty; specific reading disorder

Introduction

Reading is an essential academic skill for children related to brain function in the left perisylvian and left occipitotemporal regions (American Psychiatric Association, 2013). Children start to understand verbal language at the end of the first year. At 3 to 5 years old, they can recognize and copy some letters. At 4 to 5 years old, they learn basic reading skills, including distinguishing sounds within a word (phonological awareness), memorization of letters (the alphabetic principle), and learning how to combine letters into sounds (phonics). They then learn to extract meanings from words or come to understand symbols (decoding) and rapidly read keywords out loud (rapid automatized naming). The rapidity of reading (fluency) follows when they enter early elementary school (National Reading Panel, 2000; RTI International, 2016; Ruangdaraganon, 2008).

Dyslexia is a specific neurodevelopmental disorder in children that impacts their reading outcomes unrelated to their level of intelligence (American Psychiatric Association, 2013). Significant variation in the prevalence of dyslexia is found in different studies. In the United States of America, there was a reported 10% lifetime prevalence of learning disorders, with dyslexia accounting for 80% (Altarac & Saroha, 2007). Meanwhile, in Thailand, a 6.3% to 7.8% prevalence of dyslexia was found among elementary school students (Roongpraiwan et al., 2002; Sangsupawanich et al., 2011).

Four times as many boys than girls have dyslexia. Moderate to high heritability contributes to dyslexia. Previous studies indicated that if either the mother or father has dyslexia, there is a 50% chance their child will also have dyslexia. Moreover, there is a 50% chance that a child with dyslexia will have a sibling with dyslexia. Many developmental and hereditary diseases are related to dyslexia. Additionally, a child with a developmental language delay is also at risk of dyslexia (Boland et al., 2022).

Children with dyslexia face difficulties with word recognition and "sound out" words because they cannot efficiently process and use phonemes. Accordingly, they suffer from an impairment of basic reading skills which begins to appear when they first start learning to read and write, specifically from third-level kindergarten to early elementary school (National Reading Panel, 2000; RTI International, 2016). Children with dyslexia can usually be identified at around the age of seven. Still, children can sometimes compensate for reading problems, and the disorder may not be apparent until age nine or later. They show difficulty in recognizing words and present slow and inaccurate reading. Errors include omissions, additions, and distortions of words. They require more time than normal children to master alphabetic characters, word formation, and understand the material they have read. Most children with dyslexia dislike and avoid reading and writing and become anxious when confronted with printed language demands. This disadvantage directly impacts their classroom learning, and they are often unable to complete classroom learning activities (Boland et al., 2022). Such children develop problems in the regular school system, failing to keep pace with their classmates' learning. Consequently, they lack confidence in their learning, develop classroom behavioral problems, and even experience secondary issues such as relationship issues in their own families, low self-esteem, aggressive behaviors, anxiety disorders, and drug-addiction problems (Arnold et al., 2005; Silver, 1989).

If a child can get the help they need early in their academic life—for instance, during the first grade of elementary school—the results of any intervention are significantly improved

compared to if additional help is provided only after the child is found to be failing to keep pace with their classmates' learning. Since the gap in the different reading abilities between a child with dyslexia and their classmates may not be vast, stimulating the development of reading skills to reduce that gap could be made more accessible. Doing so would also help reduce behavioral problems that the child may develop due to their failure to keep up with their reading (Boon-yasidhi, 2021; National Reading Panel, 2000; RTI International, 2016).

Diagnostic features of dyslexia include persisting difficulties in reading despite receiving educational support. Difficulties must be confirmed by individually administered standardized reading achievement measures and comprehensive clinical assessment. There are no specific physical signs or laboratory measures for this problem. Furthermore, reading problems can be caused by other issues separate from dyslexia, such as intellectual disabilities, psychosocial adversity, or inadequate educational instruction (American Psychiatric Association, 2013).

In recent years, global trends have encouraged early screening of reading ability, resulting in early diagnosis and intervention for children with dyslexia (Shaywitz & Shaywitz, 2020). However, children with dyslexia in Thailand are typically diagnosed late due to delayed detection of this problem and the lack of Thai standardized reading achievement measures for early elementary students (Boon-yasidhi, 2021; Ruangdaraganon, 2008).

Consequently, the objective of this research was to examine the reading problems and relevant factors of students in the first grade of elementary school. The results increase knowledge of early detection and early intervention of reading problems and dyslexia in Thailand.

Materials and methods

Study population

The target population was students studying in the first grade at schools in Pathum Thani province. Pathum Thani province has a total of 458 elementary schools and 76,155 students. Of the 458 elementary schools, there are 169 public schools (45,492 students) administrated by the Office of the Basic Education Commission (OBEC), 56 private affiliated schools (25,231 students), and seven local schools (5,432 students) administrated by the Subdistrict Administrative Organization (SAO). Of the schools in the study area, 60% are public schools, 33% are private schools, and 7% local schools (Pathumthani Provincial Educational Office, 2019).

The sample size calculation method was employed to estimate population proportion by defining an estimated prevalence of high-risk for dyslexia = 0.10 (Altarac & Saroha, 2007). The margin of error (d) = 0.02 resulted in a sample group of n = 1,000 persons.

Eight schools with a total of 1,25 students were selected by the purposive sampling method with a distribution based on school affiliation. Four public schools were selected with 539 students. Two private schools had 317 students, and two local schools had 269 students. The student population consists of 48 % from public schools, 31% from private schools, and 26% from local schools.

Research tools

The three utilized research tools consisted of a questionnaire to collect demographic data and factors related to dyslexia, a reading ability test, and an intelligence-scale test.

A questionnaire was used to collect demographic data and factors related to dyslexia among a child, including sex, history of delayed speech development, developmental and hereditary diseases of a child, and factors related to dyslexia in the family, such as a history of either the father, mother or siblings experiencing reading and writing difficulties. In addition, potential factors related to other causes of reading problems were gathered. The educational levels of the parents and the monthly income of the family, and a caregiver who responded to the questionnaire were used to indicate socioeconomic status and psychosocial adversity. Receiving kindergarten education and school affiliation may represent inadequate educational instruction.

A reading ability test developed by Vibulpatanavong (2012) and Vibulpatanavong and Evans (2015) was administered. The test was developed and standardized by a team of special education teachers to assess reading problems among students at each educational level. This study employed the test developed for first-grade students. The test consisted of a section that involved reading individual words and another which involved reading three short passages. Both tests were designed to test reading accuracy and fluency. Children were asked to read aloud, and the number of words they could read that were at least nearly correct within one minute was then counted as the test score. Scores from individual words and the sum of scores from the three passages were gathered for data analysis. The test did not have a cut-off score for reading problems. Instead, the percentile of scores was used to define reading problems. In this research, students with reading problems were defined by those whose scores for either reading individual words or the sum of scores for the reading passages were lower than the 10th percentile among all students who had undergone testing.

An intelligence-scale test based on Raven's Progressive Matrices was implemented (Raven et al., 2003). This test was used to separate children with an intellectual disability from children in the at-risk group for dyslexia. For this study, intellectual disability was defined as an intelligence score below 70 (IQ < 70).

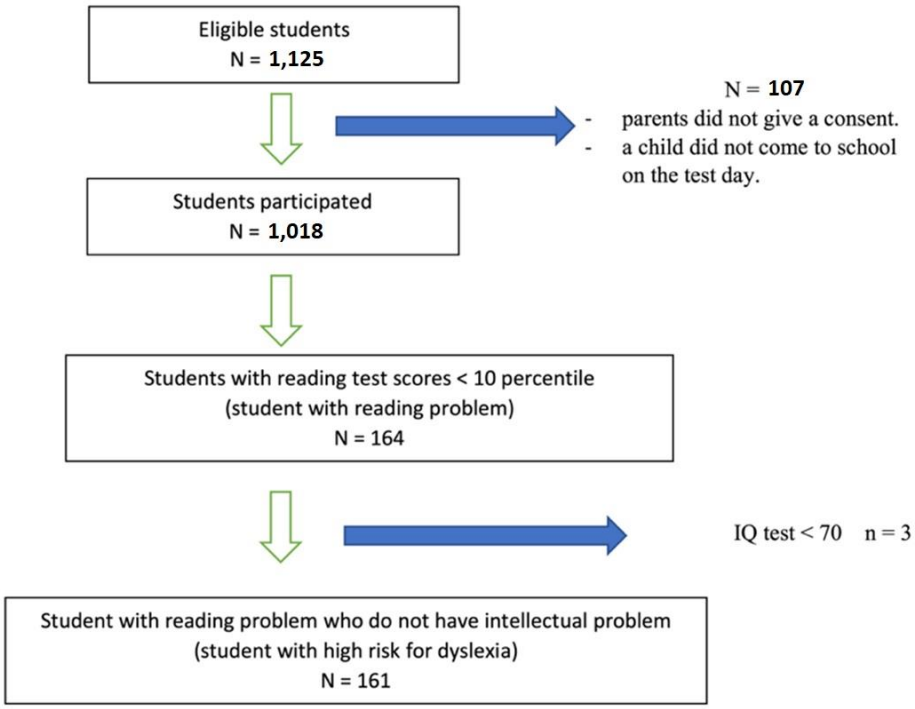
Procedure of study

The research team coordinated with the school administrators. They sent consent forms to the parents or primary caregivers of the children to authorize their participation in the research project. If the parents or caregivers consented to their child's participation, they were asked to complete the questionnaire and return it to the research team.

The researchers conducted their assessments of the students during the final part of the second semester to ensure the students had received the same education as their classmates.
The assessment took place during a period of four weeks and rotated between the participating schools, with one to three days spent at each school to ensure the students in each school were assessed during the same period. All research assistants underwent training about the reading ability test in order to deliver it to students in the same manner. One assistant was tasked with assessing all students for each type of reading test to minimize interrater bias. Students were assessed individually to increase the accuracy of the

assessments. Clinical psychologists then measured the intelligence quotients (IQ) of the students with reading scores lower than the 10th percentile to screen out children who were illiterate due to an intellectual disability from children who were in the at-risk group for dyslexia. Figure 1 illustrates the flow process of the study.

Figure 1: Summary of the Research Procedure and the Study Results



Data analysis

Descriptive statistics were used to present quantity and percentage, mean, and standard deviation and derive the prevalence percentage of students in the at-risk group at a 95% confidence interval (95% CI). Those in the at-risk dyslexia group were compared with those in the normal group regarding their various feature variables through the Fisher exact test. A linear test for trend was used to test when the feature variables under comparison were ordinal variables. Risk factors for reading problems and dyslexia were analyzed and displayed as an odds ratio at a confidence interval of 95% using a multivariable logistic regression model with a statistical significance level of 0.05.

Ethics approval

This research was approved by the Ethics Committee of the Faculty of Medicine, Thammasat University (No. MTU-EC-PE-0-201/61).

Results and discussion

Out of 1,125 students, 1,018 students entered the study, accounting for 90.5% of the total number of students. It was discovered that 164 students had reading problems (students with reading test scores <10 percentile). Of these, three were classified as having an intellectual disability (IQ test <70). Accordingly, 161 students were assigned to the at-risk group for dyslexia, with a prevalence level of 15.81% (95% CI, 13.63–18.20%). Further details are illustrated in Figure 1. The average age of the students in this study was 84.38 ± 4.73 months. The questionnaires were completed by the children's (N = 1,013) 68.61% mother, 17.57% father, and 13.82% other relatives.

Table 1 compares the factors related to dyslexia in a child and their family between students in the normal group and the at-risk dyslexia group. There were a similar number of females and males in this study. The at-risk dyslexia group included a statistically significantly higher number of males than females, a greater history of delay in speech development, more developmental or hereditary disease, and more history of difficulty in reading or writing on the part of each parent or sibling than students in the normal group. Odds ratios and 95% CI are shown in Table 1.

Table 1: Comparison of the Factors Related to Dyslexia in a Child and Family Between Normal Group and At-Risk Dyslexia Group

Characteristic (total N)	N	%	Normal group	%	At-risk group	%	Odd ratio (95% CI)	*p* value
Sex of child (1,017)								
Female	502	49.41	459	91.43	43	8.75	1	
Male	515	50.59	397	77.09	118	22.91	3.17 (2.17–4.65)	< 0.001
History of delayed speech (925)								
No	853	92.22	732	85.81	121	14.19	1	
Yes	55	5.95	36	65.45	19	34.55	3.19 (1.76–5.78)	< 0.001
Uncertain	17	1.84	13	76.47	4	23.53	1.86 (0.60–5.81)	0.2771
Having developmental or hereditary disease (942)								
No	914	97.03	784	85.78	130	14.22	1	
Yes	28	2.97	11	39.29	17	60.71	9.32 (4.19–20.75)	< 0.001
History of difficulty in reading or writing in each parent or sibling (963)								
No	885	91.90	760	85.88	125	14.12	1	
Yes	78	8.10	53	67.95	25	32.05	2.87 (1.71–4.81)	< 0.001

Table 2 compares other causes of reading problems between the normal group and the at-risk dyslexia group. Table 2 shows a statistically significant trend that a parent with a lower education level was likely to have a child in the at-risk group. Further, higher monthly incomes were associated with a reduced likelihood of a child in the at-risk group. However, caregivers who responded to the questionnaire did not differ, resulting in any statistically significant difference between the two groups. Regarding education, statistically, significantly fewer students in the at-risk group went to kindergarten than the normal group. Students from subdistrict administrative organization schools and private schools were statistically significantly less likely to be in the at-risk group than students from the Office of the Basic Education Commission (OBEC) (Pathumthani Provincial Educational Office, 2019).

Table 2: Comparison of Other Potential Factors Related to Reading Problems Between Normal Group and At-Risk Dyslexia Group

Characteristic (total N)	N	%	Normal group	%	At-risk group	%	Odd ratio (95% CI)	*p* value
Respondents to questionnaire (974)								0.144
Mothers	667	68.48	566	84.86	101	15.14	1	
Fathers	169	17.35	146	86.39	23	13.61	0.88 (0.54–1.44)	0.617
Others	138	14.17	108	78.26	30	21.74	1.55 (0.98–2.46)	0.056
Highest level of education of mother (956)								0.043*
Elementary school or less	128	13.39	102	79.69	26	20.31	1	
Middle school	243	25.4	204	83.95	39	16.05	0.75 (0.43–1.30)	0.3051
High school/ vocational certificate	300	31.38	247	82.33	53	17.67	0.84 (0.50–1.42)	0.5188
Associates degree/ high vocational certificate	87	9.10	78	89.66	9	10.34	0.45 (0.20–1.03)	0.0525
Bachelor's degree or higher	198	20.71	178	89.90	20	10.10	0.44 (0.23–0.83)	0.0098
Highest level of education of father (928)								0.001*
Elementary school or less	143	15.4	115	80.42	28	19.58	1	
Middle school	255	27.48	199	78.04	56	21.96	1.16 (0.69–1.92)	0.5771
High school/ vocational certificate	252	27.16	218	86.51	34	13.49	0.64 (0.37–1.11)	0.1104
Associates degree/ high vocational certificate	139	14.98	126	90.65	13	9.35	0.42 (0.21–0.86)	0.0150
Bachelor's degree or higher	139	14.98	127	91.37	12	8.36	0.38 (0.19–0.81)	0.0085
Average monthly family income in baht (957)								0.001*
< 10,000	218	22.78	165	75.69	53	24.31	1	
10,000–30,000	517	54.02	442	85.49	75	14.51	0.53 (0.35–0.79)	0.0014
30,001–50,000	150	15.67	136	90.67	14	9.33	0.32 (0.17–0.61)	0.0003
50,001–100,000	56	5.85	51	91.07	5	8.93	0.31 (0.11–0.82)	0.0121
> 100,000	16	1.68	13	81.25	3	18.75	0.72 (0.20–2.63)	0.6155

Characteristic (total N)	N	%	Normal group	%	At-risk group	%	Odd ratio (95% CI)	*p* value
Kindergarten attendance of child (974)								
Yes	962	98.77	812	84.41	150	15.59	1	0.0290
No	12	1.23	7	58.33	5	41.67	3.87(1.21–12.40)	0.0142
School affiliation (1018)								
Office of the Basic Education Commission (OBEC)	434	42.63	342	78.80	92	21.20	1	< 0.001
Subdistrict Administrative Organization (SAO)	269	26.42	232	86.25	37	13.5	0.59 (0.39–0.90)	0.0133
Private affiliation	315	30.94	283	89.84	32	10.16	0.42 (0.27–0.65)	0.0001
View of parents on: "How well can your child read?" (974)								< 0.01
Like the other children	646		593	91.80	53	8.20	1	
Slower than the other children	134		72	53.73	62	46.27	9.63 (5.95–15.61)	< 0.001
Faster than the other children	48		47	97.92	1	2.08	0.24 (0.03–1.77)	0.1269
Not sure	149		108	7.397	38	26.03	3.94 (2.45–6.34)	< 0.001

*Note: *Linear test for trend*

Table 3: Risk Factors Related to Reading Skills Impairment, as Determined by Multivariable Logistic Regression Analysis

Characteristic	Adjusted odds ratio (95% CI)	*p* value
Male	3.38 (2.12–5.38)	< 0.001
The child has a history of delayed speech development		0.784*
No	1	
Yes	1.22 (0.54–2.75)	0.637
Uncertain	1.54 (0.34–6.89)	0.574
The child has either developmental or hereditary disease	3.74 (1.20–11.70)	0.023
History of difficulty in reading or writing in each parent or sibling	1.89 (0.93–3.82)	0.077
Highest level of education of mother	1.00 (0.81–1.23)**	0.977
Highest level of education of father	0.78 (0.63–0.97)**	0.026
Average monthly family income in baht	0.94 (0.69–1.29)**	0.699
Kindergarten attendance of child	1.38 (0.24–7.91)	0.716
School affiliation		0.036*
Office of the Basic Education Commission (OBEC)	1	
Subdistrict Administrative Organization (SAO)	0.64 (0.39–1.07)	0.087
Private affiliation	0.50 (0.29–0.89)	0.019

*Note: *By likelihood ratio test, **decreasing Odds per one increasing category*

The statistically significant factors from Tables 1 and 2 were analyzed by the multivariable logistic regression model, with the results presented in Table 3. The following risk factors for reading problems in the at-risk dyslexia group included male gender, whether the child had ever been diagnosed with a developmental or hereditary disease, the father's education level, and the type of school the child attended.

History of delayed speech development and history of difficulty in reading and writing of the father, mother, or siblings of the child, the mother's education level, average monthly family income in baht, and kindergarten attendance were found to be statistically significantly related to the at-risk of dyslexia group in univariable analysis but were not found to be statistically significant when the factors were controlled by multivariable regression analysis.

Discussion

This study found that 15.81% of the first-grade students at the studied elementary schools had reading problems. The prevalence of this condition was relatively high compared to studies conducted both nationwide and internationally, where only 5–15% were found to have learning disorders or dyslexia (Altarac & Saroha, 2007; Roongpraiwan et al., 2002; Sangsupawanich et al., 2011). However, the students with reading problems in this study were identified to be in an at-risk dyslexia group rather than diagnosed with dyslexia. The diagnosis of dyslexia has not been confirmed clinically, and there are other factors besides dyslexia could explain the study group's reading problems.

Regarding the factors related to dyslexia in this research, male children are 3.38 times more at risk for reading problems than female children. These findings agree with previous studies that discovered that males are more at risk for dyslexia than females, with a ratio of boys to

girls of 2–3.4: 1 (Altarac & Saroha, 2007; Roongpraiwan et al., 2002). In addition to gender as a factor, this research also detected a relationship between developmental or hereditary disease and the risk of reading impairment in a child. This latter finding is consistent with the original data that had also established high comorbidity in children with developmental diseases such as attention-deficit disorder or autistic spectrum disorder with dyslexia (Piyasil & Wangtan, 2015; Shah et al., 2019). Both factors may involve gene function that controls development in many brain parts. Some studies establish a link between multiple genes that affect brain function with a concurrent association with occurrences of dyslexia. However, researchers have been unable to identify specific genes that cause dyslexia (Martin & Volkmar, 2015; Thapar et al., 2015).

After controlling factors by multivariable regression analysis, history of delayed speech development and history of difficulty in reading and writing on the part of the child's father, mother, or siblings were not statistically significantly related to reading problems in the at-risk of dyslexia group in this study. These findings do not conform to other previous studies regarding factors of dyslexia (Boland et al., 2022). However, this could also be the result of ignorance. For instance, the respondents may not have recognized delays or remembered the problems long ago.

Regarding other factors related to a reading problem, it was found that the father's educational level was intertwined with reading problems in the at-risk group during this research. The father's education level may be seen as involvement by hereditary and environmental factors which augment one another to the point of causing reading problems or dyslexia (Shaywitz & Shaywitz, 2020; Thapar et al., 2015). The connection between heredity and the environment exists in a cause-and-effect relationship. Based on findings that dyslexia is intertwined with heredity, the father of a child with reading problems may have a reading impairment, which became an obstacle to his learning and led to his low level of education. The father's education level becomes an influencing factor in framing the family's socioeconomic status and shaping its attitude toward the child's literacy (Boon-yasidhi, 2021).

Children born to parents in this group may inherit this condition directly and grow up in an environment that is not conducive to developing reading skills. When fully grown, children in this group have a high probability of fathering or giving birth to children who fall into this same group and may also be beset with this same condition. It thus becomes a problem cycle that returns repeatedly. Assisting and raising the reading ability levels of children in this group will break the problem cycle and be regarded as a way to improve the population's living standards over the long term. However, the mother's education level and monthly income were not found to be as significant factors for reading problems compared to the father's education level. This could emphasize the interplay of the role of hereditary and environmental factors in causing reading problems, rather than only socioeconomic status or psychosocial adversity.

It was interesting that affiliation with education was related to reading problems in this study. The risk of reading problems was highest (21.10%) in schools affiliated with the Office of the Basic Education Commission (OBEC), followed by local schools affiliated with the Subdistrict Administrative Organization (SAO) (13.75%). Meanwhile, private schools had the lowest risk of reading problems (10.16%) after controlling for factors such as family income and parental education, which are socioeconomic factors capable of affecting the choice of the child's educational institution and child's kindergarten education which could result in a different reading skill baseline. Nonetheless, it was found that different affiliation of the educational institution has a bearing on the child's reading problems. The differences found may reflect

the difference in the quality of educational instruction between school affiliations. There may be other factors such as the attitudes and attention of the parents and teachers toward the literacy levels of their children that could affect the result in reading abilities to differ between the variously affiliated schools. These factors were not studied in the present research and should be studied in future research.

In a study conducted in other countries, it was found that high-quality classroom instruction and intensive supplementary instruction in small groups helped to reduce the number of children with basic-skills impairments in primary education by 6% (Martin & Volkmar, 2015). Accordingly, intensive, supplementary, and small-group instruction will be carried out in the next phase of this research project. Results of future phases of this research work will be monitored to determine whether it plays a role in reducing the prevalence of reading problems in these differently affiliated schools.

Another interesting finding is that the parents' and caregivers' perceptions of their child's reading skills accurately detected reading problems. This information from caregivers should be integrated with other information from the school to help early detection of reading problems and dyslexia.

In summary, regardless of factors related to dyslexia that cannot be changed, such as sex, history of developmental disorder, and the father's education level, we can still focus on screening and early detection of students with these risk factors. However, school affiliation is a factor relating to a reading problem that can be modified and should receive more attention. Different educational instruction and other potential causes that can lead to different reading outcomes between school affiliation should be explored and improved.

A strength of this research was using a population-based survey that had a response rate of 99%. There was only a small recall bias in the survey since it involved responses to a questionnaire from the parents without them knowing their child's reading test results. Screening criteria of students at risk for dyslexia were based on the child population. Furthermore, this research required training research assistants to administer the reading test to the children. Only one research assistant was employed for each step of the reading test to minimize bias in the children's answers.

Nonetheless, this research had a limitation in using purposive sampling to screen schools rather than probability sampling. This means that the sample may not truly represent the population of Pathum Thani or Thai children generally. The study results may therefore have limited generalizability. Nonetheless, screening the schools based on their affiliation in the present study helped make the obtained results more representative of schools in Pathum Thani.

Conclusion

From this study, the factors related to reading problems and risk of dyslexia in early elementary students included male gender, students with either a developmental or hereditary disease, students whose fathers had a low education level, and school affiliation. These factors will help form guidelines for the early identification of children in the at-risk group for dyslexia and improve the quality of education in early elementary schools with different affiliations.

Acknowledgments

The National Research Council of Thailand supported this research for the fiscal year 2018. The study is supported by the Research Group in Clinical Epidemiology from Faculty of Medicine, Thammasat University.

References

Altarac, M., & Saroha, E. (2007). Lifetime prevalence of learning disability among US children. *Pediatrics, 119*(Suppl. 1), S77–S83. https://doi.org/10.1542/peds.2006-2089L

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). American Psychiatric Association. https://doi.org/10.1176/appi.books.9780890425596

Arnold, E. M., Goldston, D. B., Walsh, A. K., Reboussin, B. A., Daniel, S. S., Hickman, E., & Wood, F. B. (2005). Severity of emotional and behavioral problems among poor and typical readers. *Journal of Abnormal Child Psychology*, *33*(2), 205–217. https://doi.org/10.1007/s10802-005-1828-9

Boland, R., Verduin, M. L., & Ruiz, P. (Eds.). (2022). *Kaplan & Sadock's synopsis of psychiatry* (12th ed.). Wolters Kluwer.

Boon-yasidhi, V. (2021). *จิตเวชศาสตร์เด็กและวัยรุ่นในเวชปฏิบัติ [Child and adolescent psychiatry in clinical practice]*. Department of Pediatrics, Faculty of Medicine, Siriraj Hospital Mahidol University.

Martin, A., & Volkmar, F. R. (2007). *Lewis's child and adolescent psychiatry: A comprehensive textbook* (4th ed.). Lippincott Williams & Wilkins.

National Reading Panel. (2000, April). *Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction*. https://www.nichd.nih.gov/sites/default/files/publications/pubs/nrp/Documents/report.pdf

Pathumthani Provincial Educational Office. (2019). *ข้อมูลสารสนเทศ ปีการศึกษา 2561 ของสำนักงานศึกษาธิการจังหวัดปทุมธานี [Information for the academic year 2018 of the Office of Education, Pathum Thani Province]*. http://pathumpeo.com/news-detail_2038_28426.

Piyasil, V., & Wangtan, S. (2016). Learning Disorders and Comorbidity. *Journal of the Psychiatric Association of Thailand, 60*(4), 287–296. https://he01.tci-thaijo.org/index.php/JPAT/article/view/45616

Raven, J., Raven, J. C., & Court, J. H. (2003). *Manual for Raven's Progressive Matrices and Vocabulary Scales. Section 1: General Overview*. Harcourt Assessment.

Roongpraiwan, R., Ruangdaraganon, N., Visudhiphan, P., & Santikul, K. (2002). Prevalence and clinical characteristics of dyslexia in primary school students. *Journal of the Medical Association of Thailand, 85*(11), 1097–1103. http://www.jmatonline.com/index.php/jmat/article/view/4891

RTI International. (2016, March). *Early Grade Reading Assessment (EGRA) Toolkit* (2nd ed.). United States Agency for International Development. https://pdf.usaid.gov/pdf_docs/pa00m4tn.pdf

Ruangdaraganon, N. (Ed.) (2008). *ตำราพัฒนาการและพฤติกรรมเด็ก [Child development and behavior textbook]*. Holistic Publishing.

Sangsupawanich, P., Tantivess, S., Sanguan, K., Pattanaphesaj, J., Lekuthai, W., & Worachotekamjorn, J. (2011). *การคัดกรองโรคสมาธิสั้นและความบกพร่องด้านการเรียนในโรงเรียน [School-based screening for attention deficit and hyperactivity disorder (ADHD) and learning disorders (LD)].* Thai Health Promotion Foundation. https://www.hitap.net/research/17541

Shah, H. R., Sagar, J. K. V., Somaiya, M. P., & Nagpal, J. K. (2019). Clinical practice guidelines on assessment and management of specific learning disorders. *Indian Journal of Psychiatry, 61*(Suppl. 2), 211–225. https://doi.org/10.4103/psychiatry.IndianJPsychiatry_564_18

Shaywitz, S. E., & Shaywitz, B. A. (2020). Dyslexia. In R. M. Kliegman & J. St Geme (Eds.), *Nelson Textbook of Pediatrics* (21st eds) (pp. 267–269). Elsevier.

Silver, L. B. (1989). Psychological and family problems associated with learning disabilities: Assessment and intervention. *Journal of the American Academy of Child & Adolescent Psychiatry, 28*(3), 319–325. https://doi.org/10.1097/00004583-198905000-00003

Thapar, A., Pine, D.S., Leckman, J. F., Scott, S., Snowling, M. J., & Taylor, E. A. (Eds.). (2015). *Rutter's child and adolescent psychiatry* (6th ed.). Wiley-Blackwell.

Vibulpatanavong, K. (2012). *The development of phonological awareness and the relationship between phonological awareness and Thai language reading ability in lower primary school students in Thailand*. The University of Sydney.

Vibulpatanavong, K., & Evans, D. (2015, July 28–31). *Off to a Good Start: Enhancing Reading Skills in Thai Children* [Paper presentation]. The First International Conference on Special Education, Bangkok, Thailand.