Brief Research

Prevalence and related factors of at-risk of dyslexia in Thai preschool children

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Abstract

Introduction: This study aimed to investigate the prevalence of at-risk of dyslexia and its risk factors in Thai preschoolers. Our results found a relatively high prevalence of at-risk of dyslexia preschoolers (22.14%). Family socioeconomic status, family history of learning difficulties, and the child's language development were risk factors for this condition.

Keywords: Dyslexia, Preschool, At-risk for dyslexia, Language development, Family socioeconomic status

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Introduction

Dyslexia, also known as "specific learning disorder with impairment in reading" according to the Diagnostic and Statistical Manual of Psychiatric Disease (DSM-5), is a neurodevelopmental disorder characterized by impairments in decoding, word reading accuracy and fluency, and spelling despite age-appropriate language comprehension skills.[1] Besides, children with dyslexia may experience learning difficulties, retention, and dropping out of school. The prevalence of dyslexia varies from 5 - 17.5% worldwide[2] and 6.3% in Thailand.[3]

Based DSM-5, dyslexic children must be diagnosed during school age and have persistent impairment for at least six months despite adequate specific intervention[4]. The previous longitudinal observational study of dyslexic children revealed that those children still had lower reading skills than their typical peers from the first grade persisting to 12 years later[5]. Thus, early identification of children with dyslexia risk in preschool years leads to the specific intervention they need, which may be more effective. Therefore, knowing the prevalence and risk factors of preschoolers at risk of dyslexia is vital for early detection to achieve rapid remediation. However, Thailand currently does not have this data. Therefore, this study aims to evaluate the prevalence and the risk factors associated with preschoolers at risk of dyslexia.

Methods

Study Design and Participants

This study used secondary data from Wannapaschaiyong's unpublished randomized control trial to evaluate the effectiveness of computer-based early intervention in Thai preschool children in the at-risk of dyslexia population. A sample of 140 preschool children aged 60 to 66 months were conveniently recruited from all eight kindergarten schools in Bangkok. Participants would be excluded from the research if they had delayed language development, attention deficit hyperactivity disorder, or autism spectrum disorders.

Data Collection

Siriraj Institutional Review Board approved the original study (Protocol number 794/2562). Data were collected from January 2020 to December 2020. The original study distributed the announcement to all kindergarten schools in Bangkok. If the parents were interested, the investigator contacted them to make an appointment to clarify the study process.

The parents of the accepted participant were informed, and the consent was signed before enrolling in the original study. All participants were assessed for dyslexia risk using the Rama Pre-Read (RPR). At-risk participants were randomly assigned to treatment groups according to the original study's protocol. This study used part of the original data on all 140 participants, focusing on the prevalence and risk factors of children at risk of dyslexia.

Research Instruments

Each participant was evaluated in 4 domains, consist of:

1. Sociodemographic information form

This form recorded the participant's demographic information, including sex, age, daily screen time, time spent reading a storybook with their parents, number of storybooks in their house, family history of learning difficulties, parental educational level, and monthly household income.

2. Denver II[6]

Denver II, a child development screening tool, were used to assessed our participants' development. The results were classified as normal, suspected delayed, and untestable. Denver II had a sensitivity of 0.56-0.83 and a specificity of 0.43-0.80.

3. Mullen Scales of Early Learning (MSEL)[7]

The receptive and expressive language were assessed with MSEL, a standardized developmental level and cognitive ability test. Internal consistency ranged from 0.45 to 0.77, and Inter-rater reliability was strong and ranged from 0.91 to 0.99.

4. Rama Pre-Read (RPR)[8]

The RPR is a paper-based, pre-literacy reading test often used as an initial assessment for children at risk of dyslexia in Thailand. The RPR consisted of 3 subtests: letter knowledge, rapid letter automatized naming, and initial sound

matching subtest. Children who scored below the 10th percentile in each subtest were considered at risk of dyslexia, following a study by Yampratoom et al[8], where the 10th percentile cut-off was established based on normalized data from 412 Thai children aged 60-71 months. Yampratoom et al. explained that the RPR uses conservative cut-off criteria for the purpose of an early detection, which could potentially lead to a prompt early intervention training.

Statistical Analyses

This study performed descriptive analysis to calculate the frequency, percentage, means ± standard deviation (SD), and median (min–max). To compare the mean between at-risk children and children without dyslexia risk, chi-square test, independent t-tests and Mann-Whitney U tests were used. All statistical analyses were performed using SPSS version 28.0 (IBM Corporation, Armonk, NY).

Results

One hundred forty participants from all 8 kindergarten schools in Bangkok were enrolled in this study. All participants had normal developmental levels as assessed by Denver II and MSEL. 31 participants (22.14%) were classified as at-risk of dyslexia based on RPR assessment. Compared to participants without dyslexia risk, the at-risk participants had a significantly lower score of all subtests of RPR than the not-at-risk participants, as shown in Table 1.

Table 2 shows that the risk factors differed between at-risk and not-at-risk participants. The at-risk participants had longer daily screen time, less time reading storybooks with their parents, and fewer storybooks in the house compared to the not-at-risk participants. In addition, the at-risk participants had lower parental educational levels and lower monthly household income. Family history of learning difficulties was more common among at-risk participants than not-at-risk participants. Besides, at-risk participants had significantly lower receptive and expressive language scores.

Table 1 RPR test scores of participants

RPR subtests	Not-at-risk participants (n=109)	At-risk participants (n=31)	*P*-value
Letter Knowledge	71.43 ± 12.59	48.83 ± 15.91	< .001***
Rapid Letter Naming[a] (seconds)	78 (35,120)	160 (92,260)	< .001***
Initial Sound Matching[a]	7 (3,10)	0 (0,1)	< .001***

Data presented as mean ± SD, [a]Data presented as median (min, max)
*** significant with level of *P* < 0.001

Table 2 Comparison of characteristics and factors relating preliteracy reading skill

Characteristics	Not-at-risk participants (n=109)	At-risk participants (n=31)	*P*-value
Male, person[b]	49 (44.95)	16 (51.6)	.512
Age (months)	64.17 ± 2.12	64.74 ± 1.75	.135
Screen time (hours)[a]	1.5 (0,6)	2 (0,6)	.031*
Reading time (hours)[a]	1 (0,3)	0.5 (0,2)	.046*
Number of storybooks in the house (books)[a]	40 (0,100)	10 (0,100)	< .001***
Family history of learning problem[b]	2 (1.83)	7 (22.58)	< .001***

Table 2 Comparison of characteristics and factors relating preliteracy reading skill (Cont.)

Characteristics	Not-at-risk participants (n=109)	At-risk participants (n=31)	P-value
Parental education (below the bachelor's degree)[b]			
Paternal education	17 (15.60)	13 (41.94)	.002**
Maternal education	12 (11.01)	16 (51.61)	< .001***
Monthly household income[b]	.02*		
<30,000 baths	12 (10.9)	11 (35.48)	
≥30,000 baths	97 (89.1)	20 (64.52)	
MSEL (T-scores)			
Receptive language	49.27 ± 7.00	39.03 ± 6.50	< .001***
Expressive language	44.28 ± 8.62	36.90 ± 6.98	< .001***

Data presented as mean ± SD, [a]Data presented as median (min, max), [b]Data presented as number (percentage)

Abbreviations: MSEL = Mullen Scales of Early Learning

   * significant with level of $P < 0.05$

  ** significant with level of $P < 0.01$

*** significant with level of $P < 0.001$

Discussion

This study found that 22.14% of Thai preschool children were at risk of dyslexia. Our result was higher than the Lerthattasilp study[9], which found that the prevalence of at-risk children in Thailand was only 15.18%. The cohort of the Lerthattasilp study is first-grade students in primary schools, which is different from the population of interest. According to Ferrer's study[4], dyslexic children have lower reading skills than typical children since first grade. Early identification of the risk of dyslexia is essential, so preschoolers were our study's target population. Moreover, our data were obtained from a convenience sample. Parents of children with pronunciation and spelling problems were more likely to participate in the study than those without problems. For these reasons, our study had a high prevalence of at-risk dyslexia.

Factors associated with dyslexia risk among Thai preschool children include family socioeconomic status and the child's language development. The family socioeconomic status associated with dyslexia risk in our study was low monthly family income, low parental educational level, and less time spent reading a storybook with parents. Our results were consistent with Yampratoom's study[8], which found that all 3 factors affected a child's literacy skill through a complex interaction between genetics and environment. Moreover, fewer storybooks in the house and high-screen media use, which may reflect the family's socioeconomic status, were also significantly related to dyslexia risk.

According to our study, children at risk usually have a family history of learning difficulties, consistent with the previous study, which found that dyslexia is 60-80% heritable.[1]

Children's language development is another factor related to the dyslexia risk. Although all participants had average language scores assessed by MSEL, participants with low language scores had a higher risk of dyslexia than those with higher scores. Our results are consistent with McKean[10], who found that language development during preschool significantly affects basic reading skills during school age.

Our study has some limitation. First, the number of participants at risk of dyslexia in our study was small and resided only in Bangkok. Second, our participant age was narrow due to the limitation of the original study's protocol. Therefore, further studies should recruit a more significant number and broader age range of preschool children. Third, our study did not collect some data, such as prematurity and primary caregivers, which might influence the risk of dyslexia. Finally, our study did not follow the participants long-term, so it was difficult to determine whether participants identified as at risk of dyslexia actually develop

dyslexia. Thus, future research should collect data that may affect the occurrence of at-risk dyslexia in conjunction with long-term follow-up to determine the key factors associated with dyslexia.

In conclusion, the prevalence of Thai preschoolers in our study of at risk of dyslexia was relatively high. Our results may raise awareness among parents and teachers to early identify this condition and provide support without waiting for the child to be diagnosed with dyslexia. In addition, many factors correlated with at risk of dyslexia, including lesser time spent reading with parents, longer screen time, and poor language development, were modifiable. Therefore, addressing these risk factors is essential in reducing the likelihood of developing dyslexia in Thai preschoolers.

Author Contributions All authors approved the final article. The authors involved in the study are as follows; -.

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