Prevalence and Clinical Characteristics of Dyslexia in Primary School Students

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Abstract

Background : Dyslexia is the most common subtype of learning disabilities with a prevalence ranging from 5-10 per cent. The central difficulty in dyslexia is the phonological awareness deficit. The authors have developed a screening test to assess the reading ability of Thai primary school students.

Objective : 1. To study the prevalence of dyslexia in first to sixth grade students at Wat Samiannaree School.
2. To study the clinical characteristics such as sex, neurological signs, verbal intelligence and comorbid attention deficit hyperactive disorder (ADHD) of the dyslexia group.

Method : A total of 486 first to sixth grade students were administered "Raven's progressive matrices test" for estimation of intellectual functioning. Those who scored below the fifth percentile were labeled as mental retardation and excluded from the study. The students' reading ability was evaluated by 3 steps; first by classroom teachers using some items of the screening test, second by the researchers examining some more items individually, and third by the special educator assessing more details in reading and phonology. The students who had a reading ability two-grade levels below their actual grades and impairment in phonology were diagnosed with dyslexia.

Results : The prevalence of dyslexia and probable dyslexia were found to be 6.3 per cent and 12.6 per cent, respectively. The male to female ratio of dyslexia was 3.4 : 1. The dyslexia group had significantly lower Thai language scores than those of the normal group ($p<0.05$). All of the dyslexia group had a normal grossly neurological examination but 90 per cent showed positive soft neurological signs. Mean verbal intellectual quotient score in the dyslexia group assessed by using Wechsler Intelligence Scales for Children - Revised was 76 ± 7. The comorbid ADHD was 8.7 per cent in the dyslexia group.

Conclusion : Dyslexia was a common problem among primary school students in this study. Further studies in a larger population and different socioeconomic statuses are required to determine the prevalence of dyslexia in the general population. The authors suggest evaluating the reading ability carefully by using a test that can detect phonological awareness deficit in all children who have learning problems.

Key word : Dysplexia, Learning Disabilities

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Developmental dyslexia is characterized by an unexpected difficulty in reading in children and adults who otherwise have intelligence, motivation and schooling considered necessary for accurate and fluent reading(1). Dyslexia is the most common subtype of the learning disabilities and affects 80 per cent of learning disabled students. More importantly, dyslexia is perhaps the most common neurobehavioral disorder affecting children, with a prevalence rate ranging from 5 per cent to 10 per cent(2,3).

Now, there is a strong consensus that the central difficulty in dyslexia is a phonological awareness deficit. People with dyslexia have difficulty in developing an awareness that words can be broken down into smaller units of sound(4,5). That leads to an impairment in the ability to segment the written word into its underlying phonologic elements. As a result, the reader with dyslexia experiences difficulty, first in decoding the word and then in identifying it(6,7).

The diagnosis of dyslexia requires how to determine whether there is differentiating in reading and phonological awareness that are unexpected, given the person's age, intelligence and level of education (8-10). The measurement of phonological awareness is most significant in differentiating dyslexia from average readers(11). Standardized reading tests are an important tool in that they provide clear and objective estimates of a child's ability compared with other children of the same age(12).

Because of the difference between the English and Thai languages, the authors had to develop a screening reading test in order to measure reading and phonological awareness skills for Thai children.

The purpose of the present report was to study the prevalence and clinical characteristics of developmental dyslexia in Thai primary school students by using the screening Thai language test that was designed to assess the reading ability and detect phonological awareness deficit.

MATERIAL AND METHOD

Study population

Four hundred and eighty-six primary school students from Wat Samiannaree School in Bangkok, during the 1999-2000 academic year were enrolled in the study. They were in first to sixth grade, two classrooms in each grade. All of them were randomly selected from a pool of all classrooms in the school.

The Raven's Standard Progressive Matrices Tests was used for measuring non-verbal intelligence of the students. The students who had scored below the fifth percentile were classified as having an intellectual disability and were excluded from the study.

A Thai-language screening test was designed to assess reading ability and detect phonological awareness deficit among the students. The screening test consisted of 5 parts, including 1) reading unfamiliar words in order to exclude reading from memory, 2) reading single words in isolation in order to assess

how accurately the child can decode words that is, 3) identifying words that remain if a particular sound was removed by asking the student to omit a phoneme from a word (say "sear" without the "s" = "ear"), 4) writing spoken words, and 5) reading comprehension.

Procedures

The students were evaluated by classroom teachers using the Thai-language screening test for the evaluation of reading ability corresponding to their grade levels. The students who had reading scores below the eighty per cent level were tested by a researcher one by one to evaluate their grade-level reading skills. The students who had a reading ability two-grade levels below their actual grade were assessed for more details in reading by the special educators. The students who had marked impairment in reading and phonological awareness were diagnosed as having dyslexia and the remainder were classified as probable dyslexia.

The neurological status of students in the dyslexia group was assessed by the pediatric neurologist (P.V.). The examination included general neurological assessment and soft neurological signs that were composed of eye hand preference, imitating finger movements, sequential finger opposition and alternating fists. The verbal part of the Weshsler Intelligence Scale for Children was assessed by the clinical psychologist (K.S.).

In the study group, Conners parents rating scales and Conners teachers rating scales and DSM IV criteria for attention deficit hyperactivity disorder (ADHD) were used in order to diagnose the comorbid ADHD.

Statistics

Statistical analysis by one way ANOVA was used in order to compare Thai language score and mathematics score between dyslexia and normal students. The p-value of less than 0.05 was considered statistically significantly different.

RESULTS

A total of 486 students from first to sixth grade were enrolled in the study. Their characteristics are summarized in Table 1.

Nineteen out of 486 (3.9%) students were classified as intellectual disabilities by using Raven's Progressive Matrices test.

The prevalence of dyslexia was 6.3 per cent, whereas, the prevalence of probable dyslexia was 12.6 per cent.

The mean $\pm$ SD of Thai language scores in students with dyslexia was 63 $\pm$ 10.2 which was

Table 1. The demographic data of the study group.

Characteristics	Number of students	%
IQ (percentile)		
≥95	97	19.9
75-94	140	28.8
25-74	193	39.7
5-24	37	7.6
<5	19	3.9
Family income (baht/month)		
<5,000	266	54.5
5,001-10,000	172	35.4
10,001-30,000	39	8.1
>30,001	9	1.9
Father's educational level		
Primary school	284	58.4
Secondary school	175	36.1
Vocational school	19	3.9
Bachelor	8	1.6
Mother's educational level		
Primary school	330	67.9
Secondary school	132	27.1
Vocational school	17	3.6
Bachelor	7	1.4

Table 2. Comparison of the Thai language scores and the mathematics scores in classes among dyslexia, probable dyslexia and normal students.

Students' group	Number	Mean Thai scores ± SD	Mean mathematics scores ± SD
Dyslexia	31	63.0 ± 10.2	57.5 ± 15.1
Probable dyslexia	62	67.8 ± 10.4	61.6 ± 11.4
Normal	374	75.7 ± 10.0	67.0 ± 14.6

Table 3. The scores of subtests of verbal IQ of students with dyslexia by using WISC.

WISC	Mean scores ± SD
Verbal part	76 ± 7
Information	5.8 ± 2.3
Similarity	3.8 ± 2.3
Arithmetic	7 ± 2.6
Comprehension	1.2 ± 1.7
Digit spans	8 ± 2.3

slightly lower than that of probable dyslexia (67.8 ± 10.4). The means of both groups were significantly lower than that of normal (75.7 ± 10.1) ($p<0.05$) as shown in Table 2.

The mean ± SD mathematics score in the dyslexia group was 57.5 ± 15.1, whereas, the probable dyslexia and the normal groups were 61.6 ± 11.4 and 67 ± 14.6, respectively, as shown in Table 2. However, the differences were not statistically significant ($p>0.05$).

In the dyslexia group, the male to female ratio was 3.4 : 1. The students in the dyslexia group had normal gross neurological examination and had some positive soft neurological signs up to 90 per cent. The comorbid ADHD was found to be 8.7 per cent.

In the dyslexia group, the authors also studied the subtests of verbal IQ by using WISC, the details of which are shown in Table 3. The students with dyslexia had a lower mean verbal IQ score (76 ± 7) than that of the normal population (100 ± 15). They also had lower scores on all the other subtests, especially similarity and comprehension.

DISCUSSION

The major purpose of this study was to identify the students with dyslexia by using the Thai-language screening test that was developed in order to assess reading ability and phonological awareness. Reading ability was assessed by the measurement of decoding skills and comprehension. In school age children, decoding is more important than reading comprehension because reading passages allows bright children with dyslexia to use the context to guess the meaning of a word that they might otherwise have trouble decoding. As a result, readers with dyslexia often perform better on measures of comprehension and worse on measures of the ability to decode an isolated single word. The students with dyslexia in the present study performed worse in the decoding and phonological awareness parts that were measured by asking the students to omit a phoneme from a word and writing the spoken words that were unfamiliar (non word).

The prevalence of dyslexia was 6.3 per cent, which is similar to the prevalence rates in the previous studies[2,3]. Although reading disabilities were historically considered discrete disorders, more recent research supports the view that reading ability follows a normal distribution with dyslexia at the lower end of the continuum[13]. In the present study, the prevalence of probable dyslexia was about 12.6 per cent, which seems to follow normal distribution curve. Therefore, the authors hypothesized that probable dyslexia might be the normal variant condition of students who had weakness in reading abilities and were precipitated by the current method of learning how to read in Thailand that did not focus on the basis of decoding and phonological awareness ability.

Epidemiological and clinical studies suggested a comorbidity rate between ADHD and reading disorder of 15 per cent to 30 per cent when relatively stringent criteria were used for defining each of the separate disorders[14]. Some researchers have suggested that inattentiveness, the cardinal construct of ADHD, may be the result of learning difficulties overtime[15], whereas, others have hypothesized that the symptoms of ADHD precede and impede acdemic

performance. A third view is that ADHD and learning disabilities are separate disorders with a common underlying neurological dysfunction that co-occur in some children[16]. In this study, 8.7 per cent of children with a reading disability met the criteria for attention deficit hyperactive disorder. The relatively low prevalence was probably due to the different criteria and study setting in the diagnosis of ADHD. The authors used Conners rating scales for ADHD in a community-based study that might have a lower sensitivity than a hospital- or clinical-based study. It is important to assess both disorders in any child in order to develop a comprehensive treatment plan[17,18].

In the present study, the dyslexia group had lower scores in the verbal part of the intelligence quotient than the general population, especially in the subtest of comprehension by using WISC. It might be because the students with dyslexia had limitation in reading so they had difficulty in acquiring knowledge that they should know. The other explanation was that the low socioeconomic status and low education of the parents had influenced the students' opportunity of getting information.

The limitation of the present study was that students enrolled in the study were from only one school in Bangkok. The socioeconomic status of the studied population was quite low. So the results might not represent the general population.

SUMMARY

The authors concluded that dyslexia was a common problem among primary school students. The diagnosis required the evaluation of decoding and phonological awareness ability. Most of the students with dyslexia had abnormal soft neurological signs and had low academic achievements. In order to diagnose dyslexia, the authors propose a Thai-language screening test that focuses on the phonological awareness ability.

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การศึกษาหาความชุกและลักษณะทางคลินิกของปัญหาการอ่านผิดปกติ ในเด็กนักเรียนชั้นประถมศึกษา

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ปัญหาการอ่านผิดปกติ (dyslexia) เป็นปัญหาที่พบบ่อยที่สุดของความบกพร่องในการเรียนรู้ โดยมีความชุกในต่างประเทศประมาณร้อยละ 5–10 การวิจัยในปัจจุบันพบว่าความผิดปกติหลักของปัญหาการอ่านผิดปกติคือ ความบกพร่องในความสามารถในการแยกแยะเสียงพยางค์ที่เป็นส่วนย่อย ๆ ของคำต่าง ๆ คณะผู้วิจัยจึงได้พัฒนาเครื่องมือแบบทดสอบการอ่านสำหรับเด็กนักเรียนไทยชั้นประถมศึกษา

วัตถุประสงค์ : 1. เพื่อศึกษาหาความชุกของปัญหาการอ่านผิดปกติในเด็กนักเรียนประถมศึกษาปีที่ 1–6 โรงเรียนวัดเสมียนนารี

2. เพื่อศึกษาลักษณะทางคลินิกได้แก่ เพศ ความผิดปกติทางระบบประสาท ระดับสติปัญญาด้านภาษา และโรคซนสมาธิสั้นที่พบร่วม ในเด็กนักเรียนที่มีปัญหาการอ่านผิดปกติ

วิธีการศึกษา : นักเรียนชั้นประถมปีที่ 1–6 จำนวน 486 คน ได้รับการทดสอบสติปัญญาโดยใช้แบบทดสอบ Raven's Progressive Matrices โดยนักเรียนที่ได้คะแนนต่ำกว่าเปอร์เซนต์ไทล์ที่ 5 ซึ่งจัดอยู่ในกลุ่มที่มีสติปัญญาบกพร่องจะถูกตัดออกจากการศึกษา ได้ทำการประเมินความสามารถในการอ่านของเด็กนักเรียนโดยอาจารย์ประจำชั้น คณะผู้วิจัยและครูการศึกษาพิเศษ ตามลำดับชั้น นักเรียนที่มีความสามารถในการอ่านต่ำกว่าสองระดับชั้นเรียนและมีความบกพร่องในการแยกแยะเสียงตัวอักษร จะได้รับการวินิจฉัยว่ามีปัญหาการอ่านผิดปกติ

ผลการศึกษา : ความชุกของนักเรียนที่มีปัญหาการอ่านผิดปกติเท่ากับร้อยละ 6.3 อัตราส่วนชายต่อหญิงเท่ากับ 3.4 : 1 โดยนักเรียนกลุ่มนี้มีคะแนนภาษาไทยในชั้นเรียนต่ำกว่านักเรียนปกติอย่างมีนัยสำคัญทางสถิติ ($p<0.05$) ไม่พบความผิดปกติจากการตรวจร่างกายทางระบบประสาททั่วไป แต่ตรวจพบความผิดปกติ soft neurological sign สูงถึงร้อยละ 90 ผลการตรวจสติปัญญาเฉพาะด้านภาษาโดยใช้แบบทดสอบ มาตรฐาน Wechsler Intelligence Scales for Children Revised ในนักเรียนที่มีปัญหาการอ่านผิดปกติ มีค่าเฉลี่ยเท่ากับ 76 ± 7

สรุปผลการศึกษา : การศึกษานี้พบว่า ปัญหาการอ่านผิดปกติ เป็นปัญหาที่พบบ่อยในเด็กนักเรียนชั้นประถมศึกษา ดังนั้น จึงควรประเมินทักษะการอ่านโดยใช้แบบทดสอบที่สามารถวัดความสามารถในการแยกแยะเสียงในเด็กทุกคนที่มาด้วยปัญหาการเรียน

คำสำคัญ : ปัญหาการอ่านผิดปกติ, ความบกพร่องในการเรียนรู้

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