

CONTINUING MEDICAL EDUCATION

The Prevention, Diagnosis, and Treatment of Dyslexia

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SUMMARY

Background: Reading and spelling disorder (dyslexia) is one of the more common specific developmental disorders, with a prevalence of approximately 5%. It is characterized by severe impairment of learning to read and spell.

Methods: We discuss major aspects of the diagnosis, treatment, and prevention of dyslexia on the basis of a selective literature review and the guidelines of the German Society of Child and Adolescent Psychiatry, Psychosomatics and Psychotherapy.

Results: 40% to 60% of dyslexic children have psychological manifestations, including anxiety, depression, and attention deficit. The diagnostic assessment of dyslexia consists of a battery of standardized reading and spelling tests and an evaluation of the child's psychological state, including additional information obtained from parents and teachers. The treatment of dyslexia is based on two main strategies: specific assistance with the impaired learning areas (reading and spelling) and psychotherapy for any coexisting psychological disturbance that may be present. Evaluated preventive strategies are available for use in kindergarten and at home.

Conclusion: The diagnosis of dyslexia should be established with the aid of the multiaxial classification system. The benefit of specific treatment strategies for dyslexia has not yet been demonstrated empirically. Nonetheless, evaluated prevention programs are available in kindergarten that have been found to promote children's ability to acquire reading and spelling skills in school.

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Dyslexia is a specific developmental disorder. Some of the core symptoms of dyslexia can persist into adulthood. Around 5% of children and adolescents suffer from dyslexia (1). The psychological manifestations which often accompany dyslexia have severe effects on children, adolescents and adults with dyslexia.

Dyslexia is characterized by specific, isolated impairment of reading and spelling which cannot be explained by delayed development of cognitive abilities or low intelligence. However, the prejudice that children with dyslexia (also called reading and spelling disorder) are unintelligent and not suitable for grammar school education is very widespread.

The International Classification of Mental Disorders (2) and the Diagnostic and Statistical Manual of Mental Disorders (3) define diagnostic criteria which can be used to diagnose dyslexia and, in the case of ICD-10, also to diagnose isolated spelling disorder. Although both classification systems list dyslexia as a mental disorder, comparable to language development disorders and motor development disorders, the German public healthcare system does not recognize dyslexia as an illness, despite considerable protests from parents and sufferers, who are obliged to pay treatment costs themselves. A possible reason for this is that until the 1980s dyslexia was thought to be caused by educational methods. However, the results of basic research conducted in the last 30 years show that dyslexia has neurobiological correlates and that genetic factors affect reading and spelling ability (e1–e4).

This selective literature review is based on the guidelines of the German Society of Child and Adolescent Psychiatry, Psychosomatics and Psychotherapy.

Prevalence

Approximately 5% of children and adolescents suffer from dyslexia.

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Learning aims

The aims of this overview are as follows:

- To convey an understanding of the complexity of diagnosis
- To identify the ways in which support can be provided for dyslexia sufferers.

Symptoms

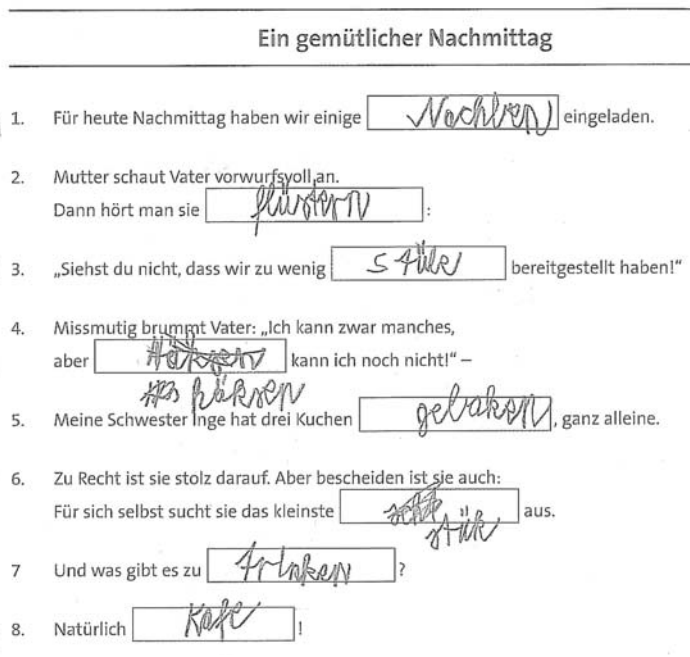
Reading disorder is characterized by very significantly reduced reading speed. Children with reading disorder often require two to three times as much time as other children, or more, to read text. Slower reading leads to great difficulty understanding what has been read, particularly when reading longer sentences.

Associating individual letters with their corresponding sounds is very slow, and mistakes are often made. In place of words which are difficult to read, children with reading disorder tend to read other words with similar letters. Some children manage to deduce the content of a sentence on the basis of the other words it contains even when individual words are read incorrectly (e.g. *hammer* instead of *matter*). It is therefore very important that diagnosis take into account not only reading comprehension but also the speed with which individual words are read aloud.

Limited reading speed is also the main symptom of reading disorder in adults (4). This occurs in particular with complex, polysyllabic, and rare words. In stressful situations, e.g. reading forms at an official office or in front of colleagues, symptoms increase. Reading disorder also manifests itself in counting (e.g. reading math word problems) and when learning foreign languages.

Spelling disorder is characterized by a significantly increased number of spelling errors. Children with spelling disorder usually spell only 10% of 40 test words correctly. In free writing, words are avoided when children suspect that they cannot spell them correctly. This is often perceived as limited vocabulary or a lack of linguistic ability. However, it is usually a compensation strategy to avoid spelling errors, which are still often corrected in red pen, with negative comments from teachers.

The development of the ability to spell comes in stages. First of all, children begin to spell phonetically, e.g. *foto* instead of *photo* or *boks* instead of *box* (Figure 1). It usually takes a year to learn all sound-letter associations. Children with spelling disorder often take two years. The next stage of spelling development is



orthographically correct writing. This includes issues such as correct use of capital and lower-case letters, suffixes (*asked*, not *askt*) and correct spelling of word roots (*happen*, not *hapen*, because the first vowel is short). The basics of correct spelling have usually been acquired before the end of the fourth year of school in Germany (age 10 years). Children with spelling disorder have great difficulties spelling words correctly, even in adulthood.

It is impossible to define subgroups of dyslexia according to etiology. Nor are there any spelling errors which are typical of dyslexia, but rather errors which can be assigned to individual stages of development.

40% to 60% of children and adolescents with dyslexia experience psychological problems. This is significantly higher than the general prevalence of psychological disorders, which according to current data from the German Health Interview and Examination Survey for Children and Adolescents (KiGGS) is between 5% and 18%, depending on the diagnostic criteria and clinical symptoms used for classification (e5, e6). Children with dyslexia experience more negative thoughts, depression, gloomy moods, and school-related anxiety as early as primary school. They often feel excluded, disapproved of by teachers, and rejected.

Figure 1: An example from German standardized spelling tests in the first years of spelling practice

Symptoms of reading disorder

Reading disorder is characterized by significantly reduced reading speed.

Symptoms of spelling disorder

Spelling disorder is characterized by a significantly increased number of spelling errors. Children with spelling disorder usually spell only 10% of the words in a writing-to-dictation task correctly.

The rate of world-weary thoughts and suicide attempts in adolescents with dyslexia is three times as high as that of adolescents of the same age without dyslexia (5, 6). The rate of depressive disorders in adolescents with dyslexia is twice as high, and anxiety disorders are as much as three times as common (7). The most common concurrent disorders at primary school age include attention deficit hyperactivity disorder (ADHD) (approximately 20%).

In addition, due to significantly improved diagnosis, dyscalculia is being identified more and more frequently (prevalence of dyscalculia: approximately 5% [e7]). ICD-10 classifies dyscalculia as combined disorders involving abilities learned in school (F81.3). For many years it was thought that those with significant problems reading and spelling must be good with numbers. This idea was not borne out by empirical research. In fact, approximately 20% to 40% of children with reading and/or spelling disorder also suffer from dyscalculia (7).

Although ICD-10 and DSM-IV are based on a clinical picture characterized by impaired development of reading and spelling, current research shows that there are three separate disorders (8):

- Combined reading and spelling disorder, or dyslexia
- Reading disorder alone
- Spelling disorder alone.

The prevalence of combined reading and spelling disorder is 8%, that of spelling disorder alone 6% and that of isolated reading disorder 7%. It appears that different neurocognitive deficits underlie each of these disorders. However, as yet there are no valid research results on this (8).

Studies involving large epidemiological samples have shown repeatedly that dyslexia is two to three times as common in boys as in girls. When differentiating between reading disorder and spelling disorder, it was shown that boys exhibit spelling problems more frequently but are affected by reading disorder in similar numbers to girls (8, 9).

Diagnosis

Diagnosis of dyslexia and of isolated reading disorder and spelling disorder is complex and relies on the following (the list is non-exhaustive) in addition to the core symptoms of reading and/or spelling disorder:

- Psychiatric disorder (ADHD)
- The child's cognitive ability (intelligence)

- Chronic diseases (diabetes mellitus)
- Negative psychosocial factors (significant distressing factors at school such as bullying)
- The child's psychosocial functional level (interaction with others of the same age).

These functional areas are represented for classification in the multiaxial classification system for mental disorders (MAS, 10) and its six axes. Developmental disorders are represented on axis II, psychiatric illnesses on axis I, intelligence on axis III, physical diseases on axis IV, psychosocial factors on axis V, and psychosocial functional level on axis VI.

Reading and spelling diagnostics

Diagnosis of reading ability should cover speed, accuracy and comprehension when reading. There are currently standardized tests available for this for German school years 1 through 6 (Table 1). A combination of various tests is needed to test word reading and reading comprehension. This involves individual testing of a child by an examiner. The child's performance is compared to that of children in the same school year. There are often standards for particular months, which means that tests should only be used during these limited time periods. Tests which were standardized more than ten years ago should not be used. There are also "reading screenings," suitable for group tests in schools but not for standard diagnosis.

There are currently standardized tests for all school years to examine spelling ability (Table 2). In these tests, children write down dictated words in sentences with gaps (Figure 1). Depending on age and grade, children are required to write down more than 20 words. There is no time limit for the test. These tests are also standardized for limited periods of time. This means that spelling tests should only be used when there are standards for the time period during which testing can be conducted.

Assessing intelligence

To describe the cognitive ability of a schoolchild with dyslexia, a test with as broad a scope as possible should be selected. One option is the WISC-IV (Wechsler Intelligence Scale for Children) (German version: HAWIK-IV, Hamburg-Wechsler intelligence test for children) (11), which has been standardized for children aged 5 to 16. In addition to linguistic abilities, this test includes logical thought, processing speed, and memory. The results profile it provides allows for

Concurrent disorders

World-weary thoughts and suicide attempts in adolescents with dyslexia are three times as common as in others of the same age. The rate of depressive disorders is twice as high, and anxiety disorders are as much as three times as common.

Reading and spelling diagnostics

Diagnosis of reading ability should cover speed, accuracy and comprehension when reading. There are currently standardized tests available for this for German school years 1 to 6.

TABLE 1

An overview of currently standardized German-language tests for reading disorder diagnosis*¹

Test	Variable measured	When to use	Standardized	References
ELFE 1–6 (reading comprehension test for children in years 1 through 6 of school)	Speed and errors when reading words, sentences, and texts silently. Time limit for individual tasks.	Last 2 months of years 1 through 6 Years 2 through 6: also half-way through the school year	2004	Lenhard W., Schneider W.: Reading comprehension test for children in years 1 through 6 of school. Göttingen: Hogrefe 2006.
LGVT 6–12 (reading speed and comprehension test for years 6 through 12)	Silent text reading, answering questions on the content of the text. Time limit for individual tasks.	Years 6 through 12 (all types of school), recommended for the second half of the school year.	2003/2004	Schneider W., Schlagmüller M., Ennemoser M.: Reading speed and comprehension test for years 6 through 12 (LGVT 6–12). Göttingen: Hogrefe 2007.
SLRT II (reading and spelling test)	Reading speed and errors measured in one minute of reading words and pseudo-words aloud.	Years 1 through 6 and adults.	2007 to 2009	Moll K., Landerl K.: SLRT II: Reading and spelling test. Bern: Published by Hans Huber 2010.
SLS 1–4 (Salzburg reading screening for years 1 through 4)	Silent reading of simple sentences in 5 minutes, assessment of accuracy of stating sentence content.	Beginning of year 2, middle and end of years 2 through 4	Unknown, probably 2003	Mayringer H., Wimmer H.: Salzburg reading screening for years 1 through 4 (SLS 1–4). Bern: Published by Hans Huber 2003/2005.
SLS 5–8 (Salzburg reading screening for years 5 through 8)	Silent reading of simple sentences, assessment of accuracy of stating sentence content.	End of years 5 through 8	Unknown, probably 2005	Auer M., Gruber G., Mayringer H., Wimmer H.: Salzburg reading screening for years 5 through 8 (SLS 5–8). Bern: Published by Hans Huber.

*¹ Selected for up-to-date standardization (no more than 10 years old)

differential diagnosis of reading and spelling weaknesses due to lower intelligence and dyslexia with cognitive abilities of at least average level. HAWIK-IV is conducted with an individual schoolchild. The length of the test depends on the child's attention span, concentration, and motivation. It is often necessary to divide the extensive testing into two periods. To ensure that children's results are fair, it is essential that testing be carried out in the morning, as this is when performance is usually highest.

Further diagnosis

In addition to developmental history, school history is also very important. It is helpful to obtain information on development in reading, spelling, counting, and other school subjects from teachers. The development of written language skills can be established with the help of samples of the child's writing (e.g. stories, free writing, dictation), possibly from several different school years. In addition to examination, question-

naires and clinical interviews can be used to assess emotional development, anxieties, and depression (12). To investigate how schoolchildren assess their own abilities at school, there are self-assessment scales for rating students' academic self concept (13). Scales to measure motivation for learning and performance (14) are a valid, reliable method for assessing motivation in school, use of avoidance strategies, and attainment of targets.

Providing a diagnosis

The results of reading and spelling tests give percentage rankings that can be used to compare an individual child's performance with that of other children in the same school year. A percentage ranking of 15 means that 85% of children in the same school year score better on the test in question. To be diagnosed with dyslexia, a child's reading and spelling performance must be well below average. This means a percentage ranking <16, which corresponds to one standard deviation

Assessing intelligence

The Wechsler Intelligence Scale for Children (WISC-IV) can be used to describe the cognitive ability of a schoolchild with dyslexia.

Test conditions

To ensure that children's results are fair, it is essential that testing be carried out in the morning, as this is when performance is usually highest.

TABLE 2

An overview of currently standardized German-language tests for spelling disorder diagnosis*¹

Test	When to use	Standardized	References
WRT 1+ (Weingarten basic vocabulary spelling test for years 1 and 2)	Last 2 months of year 1 First 3 months of year 2 January/February of year 2	2003/2004	Birkel P.: Weingarten basic vocabulary spelling test for years 1 and 2 (WRT1+). (2nd edition, newly standardized and fully revised) Göttingen: Hogrefe 2007.
WRT 2+ (Weingarten basic vocabulary spelling test for years 2 and 3)	Last 3 months of year 2 First 3 months of year 3 January/February of year 3	2003/2004	Birkel P.: Weingarten basic vocabulary spelling test for years 2 and 3 (WRT2+). (2nd edition, newly standardized and fully revised) Göttingen: Hogrefe 2007.
WRT 3+ (Weingarten basic vocabulary spelling test for years 3 and 4)	Last 3 months of year 3 First 3 months of year 4 January/February of year 4	2003/2004	Birkel P.: Weingarten basic vocabulary spelling test for years 3 and 4 (WRT3+). (2nd edition, newly standardized and fully revised) Göttingen: Hogrefe 2007.
WRT 4+ (Weingarten basic vocabulary spelling test for years 4 and 5)	Last 3 months of year 4 First 3 months of year 5 January/February and last 3 months of year 5 in secondary schools	2003/2004	Birkel P.: Weingarten basic vocabulary spelling test for years 4 and 5 (WRT4+). (2nd edition, newly standardized and fully revised) Göttingen: Hogrefe 2007.
RST 4–7 Spelling test for years 4 through 7	October to December and May to July of years 4 through 7	2002/2003	Grund M.: Spelling test for years 4 through 7 (RST 4–7). Baden-Baden: Computer & Lernen 2002–2006.
DERET 1–2+ (German spelling test for years 1 and 2)	Last 2 months of year 1 or 2 First 2 months of year 2 or 3	2003	Stock C., Schneider W.: DERET 1–2+, German spelling test for years 1 and 2. Göttingen, Weinheim: Hogrefe 2008.
DERET 3–4+ (German spelling test for years 3 and 4)	Last 2 months of year 3 or 4 First 2 months of year 4 or 5	2003	Stock C., Schneider W.: DERET 3–4+, German spelling test for years 3 and 4. Göttingen: Hogrefe 2008.
RST-NRR spelling test with new spelling rules	Age 14 to 60, separate standards for high schools and grammar schools, also age standards	2005	Bulheller S., Ibrahimovic N., Häcker H.: Spelling test with new spelling rules (RST-NRR) (2nd revised edition). Frankfurt am Main: Harcourt Test Services 2005.
R-T spelling test	Age standards for ages 15 to 30, additional age standards for high school pupils (15 to 16 years, 17 to 18 years, 19 to 30 years) and for pupils in the final years of grammar school	2004	Kersting M., Althoff K.: Spelling test (R-T) (3rd fully revised, newly standardized edition). Göttingen, Bern, Toronto, Seattle: Hogrefe 2004.

*¹ Selected for up-to-date standardization (no more than 10 years old)

below the mean. Both MAS (ICD-10) and DSM-IV require not only a divergence from the class or age level, but also a reading and spelling ability different from the level expected on the basis of the child's intelligence. In practice, this means that reading and spelling performance as measured in individual tests is compared to intelligence quotient (IQ). As there is a medium-high correlation between reading, spelling and IQ, the use of a divergence criterion in children with

low or high intelligence does not yield meaningful diagnostic results. In children with high intelligence (e.g. an IQ of 115), a spelling performance of percentage ranking (PR) <55 (the average is PR 16–84) represents a divergence of 1.5 standard deviations. Because of this, in practice a regression criterion must be used (15). This criterion, which is more appropriate methodologically, means that for the given example spelling test performance must be less than percentage ranking

Further diagnosis

- School history: development in reading, spelling, etc.
- Establish development of written language skills
- Assessment of emotional development, anxieties and depression

Self-assessment of abilities

To investigate how schoolchildren assess their own abilities in school, there are self-assessment scales on students' academic self concept.

14 (i.e. in the below-average area). *Table 3* shows the critical percentage rankings below which reading and/or spelling disorder should be diagnosed, according to individuals' overall IQ. *Table 3* shows critical divergences for both criteria (columns 1 and 2 for a divergence of 1.5 standard deviations between spelling and IQ, and columns 3 and 4 for 1 standard deviation). In other words, an individual's result must be less than the value for a given percentage ranking shown in *Table 3* in order to meet the criterion at a particular IQ and so give a diagnosis of dyslexia.

However, diagnosis must not be based on reading and spelling test scores alone. In adolescents with dyslexia or children who have received treatment, the critical borderline value may be narrowly missed, but this does not mean that the disorder has been cured. Diagnostic decisions must take a child's overall psychosocial development into account. This includes support and treatment received to date, the child's integration in school, relations with classmates and friends, and the child's family situation in terms of stress and support.

Treatment

Treatment consists initially of defining the disorder, advising parents, and possibly also advising teachers (16). Subsequent treatment depends on the severity of dyslexia and psychological symptoms or concurrent disorders. Drug treatment is not beneficial for dyslexia. Only if a dyslexia sufferer also has attention deficit hyperactivity disorder (ADHD) can drug treatment for ADHD also improve learning abilities inside and outside school.

Defining the disorder, its causes, and treatment options is usually a great relief to parents. Diagnosis often takes months to years, during which time parents, usually the mother, have tried to support their child via daily practice at home. Hours spent together every day on homework, regular (usually frustrating) dictation exercises, the child's unwillingness to study, together with despair at spelling errors in so many words in samples or tests despite so much practice, lead to constant depression in the child and feelings of failure in parents.

In addition, parents often receive reports from teachers to the effect that their child might benefit from more practice at home. If parents are then told in advice sessions that they have not failed, that their child finds it significantly harder than other children to learn to read and spell because of neurobiological deficits, this

TABLE 3

Critical values for diagnosis using regression*¹

IQ	Critical percentage ranking (divergence 1.5 SD)	IQ	Critical percentage ranking (divergence 1 SD)
70–74	1	70–73	4
75–82	2	74–77	5
83–88	3	78–80	6
89–92	4	81–83	7
93–96	5	84–86	8
97–99	6	87–88	9
100–102	7	89–90	10
103–104	8	91–92	11
105–107	9	93–94	12
108–109	10	95–96	13
110–111	11	97	14
112–113	12	98–99	15
114	13	100	16
115–116	14	101–102	17
117–118	15	103	18
119	16	104–105	19
120–121	17	106	20
122	18	107	21
123–124	19	108–109	22
125	20	110	23
126	21	111	24
127	22	112	25
128–129	23	113	26
130	24	114–115	27

*¹ www.kjp.med.uni-muenchen.de/forschung/legasthenie/diagnose.php (in German); IQ: intelligence quotient; SD: standard deviation

comes as a great relief to parents. Children themselves must also have the disorder explained to them and thereby have their stress relieved.

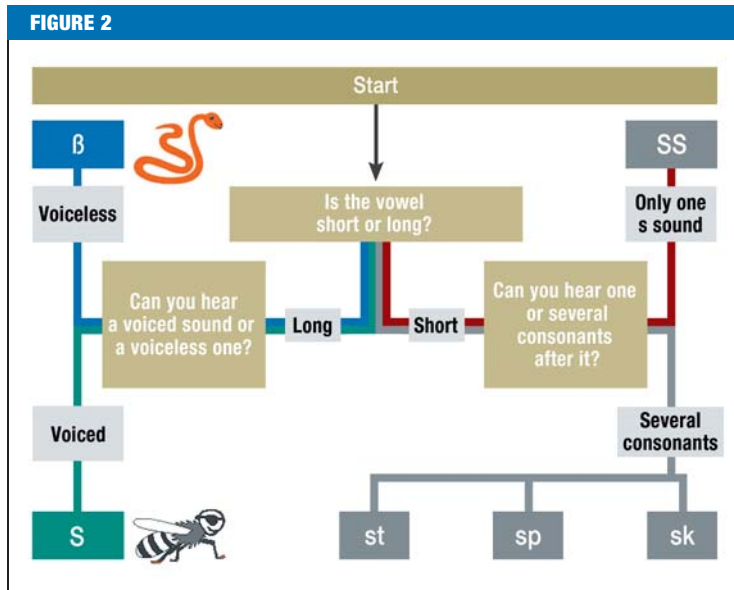
Advice for teachers serves to explain the child's psychological stress and provides an opportunity to consider together how the child can become better integrated at school. The dyslexia diagnosis must also be reported. In some German federal regions dyslexia is

Providing a diagnosis

To be diagnosed with dyslexia, a child's reading and spelling performance must be well below average. This means a percentage ranking <16, which corresponds to one standard deviation below the mean.

Treatment

- Providing information about the disorder
- Treatment of any mental symptoms and concurrent disorders
- Regular reading support
- Individual spelling support



The flowchart used at the author's clinic to show the systematic route to correct spelling of the different German s-sounds, which consists of small steps (21, 22)

recognized by educational law, which has consequences for inschool support and awarded grades.

Dyslexia treatment has two components: treatment of core problems with reading and spelling, and treatment of any concurrent psychological disorders (16).

Child and adolescent psychotherapy is available to treat psychological disorders. This aims primarily to reduce children's symptoms and improve their individual development.

To the great bewilderment of all parents, dyslexia treatment is not covered by statutory health insurance in Germany. As a result, parents must seek specialist help on the free market. As there is no nationally recognized training for dyslexia therapists, the parents' association German Association for Dyslexia and Dyscalculia (*Bundesverband Legasthenie und Dyskalkulie*, BVL) (17) has begun a program to certify training establishments. The term BVL-certified dyslexia therapist, which is granted to graduates of the corresponding training institutes, is associated with extensive theoretical and practical training. All other titles, such as dyslexia therapist, are unprotected and do not necessarily guarantee suitable qualification.

Reading support depends on an individual child's development. On the basis of detailed analysis of developmental status in reading, reading support should be provided regularly, at least once a week for at least a year. In addition to this therapy, establishing a

reading-friendly family environment with frequent reading sessions and reading together can also substantially boost reading development. Only a few types of reading support have been empirically investigated.

Spelling support must be given separately from reading support. As with reading support, individual developmental status must be determined at the outset. Support is then designed around this. Beginning with support in phonics (spelling individual sounds), children learn regular trends in spelling. For example, in English the diphthong [au] is usually spelled using the digraph *ou* (it is occasionally spelled *ow*, as in *fowl*, but more often *ou*, as in *found*). There are similar examples for double consonants, which in English words only follow short vowels (*filling* with *-ll-*, but *filing* with *-l-*). Children also learn how to use this knowledge. In a newly-developed support program from the author's working group, a flowchart (Figure 2) is used to show the systematic route to correct spelling, which consists of small steps. For spelling support, too, there are almost no evaluation data available, with only a few exceptions. The efficacy of two German-language support methods, Reuter-Liehr's "phonetic spelling" (18) and "Marburg spelling training" (19), and the current revision of the latter for secondary schools (20), has been tested (21–23). As yet there are no analyses of the level of evidence of symptom-specific intervention. Analysis of this is expected to become available in late 2010.

However, despite regular, intensive support most children with dyslexia achieve only slight improvement in their reading and spelling. The reasons for this are not well understood. Attempts are now being made to better understand the processes which are disrupted in these children by recording neurobiological correlates during treatment.

An essential part of treatment is therefore psychotherapy. Children suffering from anxiety and depression can be significantly helped by such treatment. If a sufferer also has ADHD, drug treatment is also indicated when the disorder is severe, in addition to psychotherapy.

Prevention

Because of the often chronic progression of the disorder, together with substantial psychosocial limitations and psychological stress, preventing reading and spelling difficulties is very important. As primary prevention, schemes which build on preschool support

Grades

In some German federal states dyslexia is recognized by educational law, which has consequences for inschool support and awarded grades.

No costs paid

Dyslexia treatment is not covered by statutory health insurance in Germany.

for linguistic abilities have been developed. For several years, an early support program named “Hear, Listen, and Learn” (*Hören, lauschen, lernen*) (e8) has been used in kindergartens. It is used with small groups of children a half-year before they start school, led by a kindergarten teacher (23). The focus is on language games, rhyme recognition, clapping syllables, and sound recognition. The program’s preventive effect for written language development has been confirmed in long-term studies. This early support also reduces the risk for children who are at risk of dyslexia (e9–e11). However, it is only effective when kindergarten teachers are well trained in how to use the method and correspondingly well motivated.

The significance of families in supporting language skills in preschoolers has long been known. The “Let’s read!” program (*Lass uns lesen!*) links preschool language support with reading aloud together and encouraging knowledge of the alphabet (24). In the last half-year before children start school, one parent carries out 15 minutes of activities with the child every day. With the help of three activity books and extensive materials (*Figure 3*), there are games and tasks involving rhyme recognition and creation, syllables, knowledge of words and sentences, recognition of the beginnings of words and syllables, letter-sound associations, and the ends of words and syllables. These activities are great fun for children, and the scheme also prepares them for school, as they are faced with specific tasks. The efficacy of supporting phonological abilities and language skills by reading together was assessed in two evaluation studies which show that children’s language and sound recognition abilities are increased by the Let’s read! program, and as a result the basis for learning to read and spell is improved (25, e12).

Conflict of interest statement

The authors declare that no conflict of interest exists according to the guidelines of the International Committee of Medical Journal Editors.

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Guessing Game

I think of something that begins with /L/!



I think of something that begins with /M/!



or



What goes together?

Which word begins with the same sound as the first word?



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Figure 3: An example exercise from the “Let’s read!” prevention program (adapted from [24]). With kind permission of the publisher, Dr. Dieter Winkler

Spelling treatment in German language that has proven to be effective

- Reuter-Liehr’s “phonetic spelling”
- “Marburg spelling training” for primary and secondary schools

Risk reduction

- Early support program in kindergarten a half-year before children start school
- Regular reading aloud and reading for and with children

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For issue 45/2010 we plan to offer the topic “Gliomas in Adults.”
 Solutions to the CME questionnaire in issue 33/2010:
 Madea B. et al.: The Post Mortem External Examination.

Solutions: 1c, 2a, 3d, 4e, 5b, 6b, 7e, 8a, 9d, 10c

Please answer the following questions to participate in our certified Continuing Medical Education program. Only one answer is possible per question. Please select the answer that is most appropriate.

Question 1

What concurrent disorders are often present in children with dyslexia?

- a) Touch disorders
- b) Motor disturbances
- c) Mental disorders
- d) Neurodegenerative disorders
- e) Vision disorders

Question 2

What should be examined as part of diagnosis when reading disorder is suspected?

- a) Phonation and motor coordination
- b) Linguistic understanding and vocabulary
- c) Ability to concentrate and syntax formation
- d) Articulation and eye movement
- e) Speed and comprehension when reading

Question 3

What causes particular difficulties for children with spelling disorder?

- a) Using a particular handwriting style
- b) Fine motor skills
- c) Orthography
- d) Writing within the lines on handwriting worksheets
- e) Hand-eye coordination

Question 4

What percentage of children with dyslexia also has mental problems?

- a) 0% to 20%
- b) 20% to 40%
- c) 40% to 60%
- d) 60% to 80%
- e) 80% to 100%

Question 5

What should guide dyslexia diagnosis?

- a) The six axes of the multiaxial classification system for mental disorders
- b) The five axes of the multiaxial classification system for mental disorders
- c) The four axes of the multiaxial classification system for mental disorders
- d) The three axes of the multiaxial classification system for mental disorders
- e) The two axes of the multiaxial classification system for mental disorders

Question 6

What test is standardized for children and recommended to measure a schoolchild's cognitive abilities extensively?

- a) Analytical intelligence test
- b) Hamburg-Wechsler intelligence test
- c) Minnesota Mechanical Assembly Test
- d) Intelligence Structure Test 2000R
- e) Stanford Intelligence Test

Question 7

For what part of dyslexia treatment are there studies with level of evidence 1b?

- a) Daily half-hour of reading aloud
- b) Early support using the preschool program "Hear, Listen, and Learn"
- c) Weekly training with a dyslexia therapist
- d) Intensive training with a dyslexia therapist
- e) None of the above

Question 8

What diagnostic test for reading disorder should be used in the last two months of years 1 to 6 of the German school system?

- a) ELFE 1–6
- b) LGVT 6–12
- c) SLRT II
- d) SLS 1–4
- e) SLS 5–8

Question 9

What diagnostic test for spelling disorder has separate standards for high schools and grammar schools, and also has age standards for those aged 14 to 60?

- a) TR spelling test
- b) DERET 1–2+
- c) WRT 4+
- d) RST-NRR
- e) RST 4–7

Question 10

What is the prevalence of dyslexia among children and adolescents?

- a) 3%
- b) 5%
- c) 7%
- d) 9%
- e) 11%

CONTINUING MEDICAL EDUCATION

The Prevention, Diagnosis, and Treatment of Dyslexia

Gerd Schulte-Körne

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