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SECONDARY EDUCATION STUDENTS WITH READING DISABILITY - FINDINGS FROM TWO REMEDIAL TRAINING EXPERIMENTS

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ABSTRACT

Dyslexia can have determining effects on a person's learning identity, educational choices, and life in general. This is the first scientific report focusing on the remedial training prospects for adults with dyslexia. The main purpose of the research was to provide new information about reading disability in adults and to determine the usefulness of remedial training for dyslexia in Finland. In this research, the remedial effect of training material that was created to improve the reading performance of upper secondary education students was analyzed through two different remedial experiments. The results were analyzed through statistical analysis and students' own experiences. In addition, the functionality of the diagnostic method for dyslexia and reading disability in students were studied. The sample ($n = 98$) comprised students from two Finnish education institutes who participated in two remedial training experiments. The reading of the test group ($n = 6$) and the control group ($n = 3$) selected from the sample were studied for one study year. The test group was given 20 hours of remedial training for dyslexia while the control group was not. The research group ($n = 37$) in which the diagnostic method was tested comprised of students from two Finnish vocational schools. The research results showed positive development in students' reading during the remedial training period. Statistically significant decrease in the total number of reading errors and significant increase in reading speed were found. According to the results, the cerebral hemisphere-oriented tasks in

the training material stimulated the weaker cerebral hemisphere, as expected. The training material for students with L-type dyslexia had a more positive effect than the one designed for students with P-type dyslexia.

Key words: dyslexia in adults, Bakker, dyslexia, literacy, remedial training of dyslexia, the balance model, L-type dyslexia, P-type dyslexia

1. INTRODUCTION

Literacy is regarded as a truism in the Western world. When reading goes well, it is not necessary to pay attention to it. It is like breathing, a function that does not require any special effort. However, sometimes people can have certain difficulties in reading and those people who do have such difficulties are in a very unequal position with their problems. Despite the support provided at school, not all problems have been conquered when entering adulthood. There is plenty of research-based information about reading disability but mainly the studies have focused on children's and youngsters' problems. So far, reading disability in adults has remained less studied. Moreover, remedial studies of reading disability have strongly emphasized on supporting readiness for reading and prevention of reading disability. Clearly less information is available about means of improving fluent reading and how dyslexia as a learning problem is connected with educational and learning issues in adults (Huemer, Salmi, & Aro, 2012). This study focused on this theme.

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Becoming a fluent reader requires work. Any remedial training will not help if the methods it includes are not practiced diligently in practice. If a child's reading skills have remained defective, he or she might cope with the problems without ever having helped. Problems with reading can also influence on the child's learning identity (Thunborg, Bron, & Edström, 2012), and therefore, early dyslexia has consequences that extend over decades in one's life through choices one makes based on the impression one has about oneself as a reader and a learner. In adulthood, dyslexia is shown to be connected with certain behaviors that influence on for example the education and career choices of people with dyslexia. They tend to make practical choices concerning their future which means that their future profession or work tasks are not likely to include much reading skills although they would be capable of doing more demanding tasks (Ingelsson, 2007; Taylor & Walter, 2003).

In addition to the predisposition of avoiding professions or education that require plenty of reading, dyslexia in adults can be difficult to detect. What is problematic in adults' dyslexia is that many of these adults have already gotten used to live with dyslexia. Only lately dyslexia in adults has become more evident since adult education has become more popular as the means of decreasing modern social problems such as unemployment and exclusion from society (Ahonen & Rautakoski, 2007). Likewise, increased knowledge about human beings, genotype, and neuropsychological research has helped also researchers studying dyslexia. Yet, much remains to be studied: the purpose of this study is to produce new information about dyslexia in adults and its remedial training in Finland. In this research, the remedial effect of training material that was created to improve the reading performance of upper secondary education students was analyzed through two different remedial experiments.

2. THEORETICAL PERSPECTIVES ON DYSLLEXIA

Genetic researchers' discovery of four dyslexia genes represents the top knowledge in the field (Cope et al., 2005; Hannula-Jouppi et al., 2005; Meng et al., 2005; Taipale et al., 2003). This has advanced significantly the research on the inheritance of reading disability. Indeed, researchers agree that along with genotype neurobiological factors are the core elements in dyslexia (e.g., Nicolson, Fawcett, & Dean, 2001; Ramus et al., 2003; Stein & Walsh, 1997).

In this research, we lean on Dirk Bakker's balance model because it seemed to offer the best approach to analyze dyslexia in adults and the changes remedial training would have. Bakker (1992) and his research-

er colleagues developed the model of the balance of brain activity regarding reading processes, their development and dysfunction. The model is based on Luria's brain lateralization theory (Luria, 1982). The classification of dyslexia that is based on Bakker's model covers the scope of specific dyslexia to which only 3-5 % of each age cohort belongs depending on the definition (e.g., Harris & Hodges, 1981; Hynd & Hynd, 1984; Lorusso, 2006). According to Hynd and Hynd (1984) a person has specific dyslexia if

- (a) he or she fails to learn to read and write despite his or her normal intellectual capacity and normal sensory processes,
- (b) dyslexia can be diagnosed with valid measurements,
- (c) dyslexia can be seen connected to central nervous system failure.

According to the model, both cerebral hemispheres participate in the reading process but they have a clear distribution of work. The developmental phase of the reading process is connected to which cerebral hemisphere has control over the reading event. Bakker (1990; 2006) claims that at the beginning of learning to read, the processes of the right cerebral hemisphere have emphases. In this phase, letters, words, and clauses are strange and difficult to piece together. A child interprets them as figures or spatial shapes. Mostly, the right cerebral hemisphere participates in this process because it is specialized in visual-spatial perception. At school, a child learns that there are many kinds of letters that are sometimes difficult to distinguish. When practicing reading, a child will find out that the meaning of letters depends on their spatial position. The child will also learn that the meaning of words depends on the sequence of letters from left to right.

In addition, understanding the difference between the visual form of letters and their meaning requires different kind of conceptualization than recognition of objects or things. An object maintains its meaning regardless of its spatial position. An apple is always an apple whether you looked at it from above or below, left or right. Instead, if the letter b turns 180 degrees around its axis, it becomes the letter d and its meaning changes. The conceptualization of letters is more difficult when considering that the meaning of letters does not always change if the shape changes. Lower case letter d and upper case letter D are pronounced in the same way although their visual shape is different. When a letter is read aloud, its phoneme is connected to its visual appearance. This coding happens in the left cerebral hemisphere (Bakker, 2002, 2006; Bakker, Van Strien, Licht, & Smit-Glaudé, 2007).

Also experimental arrangements (Porta, Kraft, & Harper, 2010; Waldie & Mosley, 2000) have shown

the activation of the right cerebral hemisphere at the beginning of the process of learning to read. The significance of phonological decoding in the methods of learning to read is the most important. Decoding words which leads to the recognition of words can be more important to learning to read than visual decoding of whole words. The change in the brain balance when reading various texts has been studied with electroencephalography (EEG) and event-related brain potential (ERP) measurements that show the activation of cerebral hemispheres during a reading performance (Bakker, 1990). The results show that lateralization is connected to the processing of language and linguistic development.

Little by little the nature of reading changes and the left cerebral hemisphere starts to be responsible for the reading process. In addition to the conceptualization of visual shapes, reading requires the recognition of the content and structure of language which is controlled by the left hemisphere of the brain (Bakker, 1990, 2006; Bakker et al., 2007). This linguistic process is dominating as the reading skill improves. The recognition of letters turns natural and conceptualization becomes clearer as the forms of letters and words become more familiar. The reader does not have to think each letter and word separately. The reading event becomes automated and words are recognized as iconic pictures. They are connected with their linguistic meaning and thus they can be attached to their context. The reader's vocabulary improves and becomes more versatile, and texts become more familiar. The reader learns to read words faster and more accurately. As the reading advances toward understanding reading, the emphasis in reading processes starts to move from the right to the left cerebral hemisphere.

Bakker (1990) explains that when an ordinary reader reads easy everyday texts such as comics the left cerebral hemisphere participates in reading more dominantly than the right. The balance is on the left while the participation of the right cerebral hemisphere is secondary. The simplicity of a reading event is described as *perceptually simple reading*. Reading and understanding expository texts requires significant effort from a good reader, too. The activation of the right cerebral hemisphere is shown to increase when reading these types of demanding texts. This is called *perceptually complex reading*. A reader who has developed normally can use flexibly the strategies of both cerebral hemispheres as reading situations and texts necessitate.

3. TWO TYPES OF DYSLEXIA

As the reading skill improves, the left hemisphere should take the control over the process. However,

some learners are trapped to the level of learning to read (Bakker 1990; 2006; Bakker, Bouma, & Gardien, 1990). According to Bakker, this means that one has P-type or perceptual dyslexia. In P-type dyslexia, reading disability comes from the overdeveloped functioning of the right cerebral hemisphere or underdeveloped functioning of the left cerebral hemisphere or their joint effect. In P-type dyslexia (Bakker, 1990; Bakker & Vinke, 1985), the reader clings to the visual form of the text and perceives words as outer characters without understanding their symbolic meanings. Reading is slow but quite faultless. As the right cerebral hemisphere controls readings it also prevents the reader from using the strategies of the left cerebral hemisphere efficiently.

On the other hand, some learners start to use the strategies of the left cerebral hemisphere too early. This dysfunction is called L-type or linguistic dyslexia (Bakker, 1990; 2006; Bakker et al., 1990). Reading disability comes from the overdeveloped functioning of the left cerebral hemisphere or underdeveloped functioning of the right cerebral hemisphere or them both. People with L-type dyslexia try to figure out the meaning of the text mainly from linguistic clues and do not pay attention to the visual forms of texts. Attention in reading is focused on the semantic and syntax features prematurely and inappropriately. Therefore, the right cerebral hemisphere cannot perform its tasks. Reading is fast but negligence in conceptualization leads to many errors.

Bakker with his work group has developed a way of diagnosing dyslexia from reading errors and time used for reading because certain types of errors evince cerebral dysfunctions. Reading errors combined with time show which cerebral hemisphere the reader uses. P- and L-type reading can be evaluated by reading accuracy and time. Reading performances are scored by subtracting the number of errors from the total number of words. This is who the reading speed, accuracy, and performances can be compared based on the number of words, errors, and their remainder (Bakker, 1990; Bakker, Teunissen, & Bosch, 1976).

Bakker (1990) argues that it is not enough to study only reading speed and accuracy but other features of reading style must be noticed, too. All errors are not equal but they can be divided into *substantive* and *time-consuming* errors. Substantive errors are real errors leading to wrong reading result. Time-consuming errors are not traditional errors but words that are read in a fragmented manner or repeatedly but eventually correctly. Substantive errors typify L-type and time-consuming errors P-type dyslexia. Substantive errors are divided into omissions, replacements, and additions. Time-consuming errors include disintegrations, repetitions, and corrections.

Bakker has created an error classification for various errors in P-type and L-type dyslexia (Bakker, 1990; Bakker et al., 1976; Bakker, Moerland, & Goekoop-Hoefkens, 1981).

4. REMEDIAL TRAINING OF DYSLEXIA

Two training programs that are based on different neuropsychological approach have been developed for P- and L-type dyslexia: direct Hemisphere-Specific Stimulation (HSS) method and indirect Hemisphere-Alluding Stimulation (HAS) method. In the direct method, the cerebral hemisphere is activated directly through the sense of touch of ear or hand, or through the field of vision. In the indirect method, the cerebral hemisphere is activated indirectly through various texts, linguistic exercises, and games (Bakker, 1990; Bakker & Vinke, 1985). Training materials must match the level of the person with dyslexia and the visual typography of the text has to be suitable to both types of dyslexia. Various texts can be used in training groups too (Bakker, 1990).

5. METHOD

5.1 Research Questions

The purpose of the research was to produce new information about dyslexia in adults and its remedial training in Finland. On the other hand, there is international little research on dyslexia in adults and therefore the study was to have wider contribution to the field as well. The following questions were set for the study:

- (1) What kind of reading disability in students could be recognized with the classification system based on the brain balance model?
- (2) How was the remedial training intervention realized to remedy reading disability in students?
- (3) How did the remedial training intervention affect the development of students' reading skills?
- (4) How did the students perceive the influence of the remedial training intervention in the development of their reading skills?

5.2 Remedial Training Material

In this study, the training material called *Kuntoutusjyviä [Remedial Morsels]* was based on the model of brain balance (see section 4) and aimed for upper secondary level students. Remedial Morsels is a 20-hour-long training program and its exercises are

indirect HAS methods. P- and L-type readers have their own training files. Exercises are repeated in similar ways during each lessons. At the beginning of a lesson students read a text which is a causerie published in a Finnish newspaper. Each causerie discusses language from various points of view in a humorous manner (Räsänen, 1999).

After reading, students discuss the text. The purpose of the discussion is to make sure that the content of the text has been understood. After the discussion, students do exercises. The first exercise is always about reading comprehension related to the text read at the beginning of the lesson. During the first lessons, the reading comprehension exercises are repetitious but become more difficult little by little. Some of the last exercises require application which means that students do not find the answers directly from the text but have to deduce them. The second and third exercises are always focused on a certain cerebral hemisphere, and therefore, they are aimed either P-type or L-type readers. Depending on the type, exercises can differ greatly from each other. If some exercise seems overwhelming, the teacher can help the student to move on with the task.

After finishing the exercises, they are checked together which makes a part of learning. One lesson is supposed to last 60 minutes. If they repeatedly seem to last longer, the teacher can have the students read only part of the text and omit part of the reading comprehension exercises. The second and the third exercise must be done in each lesson because they are focused on cerebral hemispheres and are thus important for the remediation. Discussion and checking should last about 20 minutes. Various types of readers can be in the same group but exercises can be checked faster if groups are separate.

The purpose of P-type readers' exercises is to make reading more fluent and faster and therefore they are focused on the left hemisphere of the brain. Respectively, L-type readers' exercises aim at calming down and making reading more slowly in order to cut reading errors by activating the functioning of the right hemisphere of the brain. The training material is designed so that most of the exercises train the weaker cerebral hemisphere to balance reading (Räsänen, 1999; Matilainen, 1999).

5.3 Pre-testing of the Analyzing Structure for the Remedial Training

Dr. Vanninen created a classification system that could be used together with Remedial Morsels exercises in 1999-2000. The system was necessary because there was not any diagnostic tool to evaluate reading disability in upper secondary education students available. The classification system can be

used in two different ways: first, it evinces the possible dyslexia in students and second, it can separate P- and L-type dyslexia from other reading disabilities. The classification system helps the teacher select students that can be trained with the method, in other words P- and L-type readers. The classification system divides reading errors according to Bakker's model into P- and L-type errors (Bakker, 1990; Bakker et al., 1981; Bakker et al., 1976; Bakker & Vinke, 1985). The reading text used in the classification was Pekka Rautamaa's causerie *Muistiinpanoja [Notes]*.

The test group (n = 37) in which the diagnostic method was tested comprised of students from Liperi and Joensuu Vocational School. The students were first and second year students of the study year 1999-2000. The group had 13 men and 24 women. Readers with various skills were selected in the research group in order to have the average as close as possible to the real reading skill average.

The members of the research group read the causerie aloud on tape. P- and L-type errors were counted and compared with the reading time. The results were put into SPSS software and the reading errors were proportioned within the distribution of errors.

The students' average reading time was **3 min 58 s**. The fastest reader read the text in 2 min 32 s and the slowest in 6 min 22 s. The sum of P- and L-type errors was on average 27 errors. The best reader made two errors and the weakest 83 error in the 315 words read. The number of P-type errors varied between 0-45 and L-type errors between 0-53. The average number of P-type errors was 12 and L-type errors 15.

The classification method was developed by moving from the average number of errors one dispersion unit (18.32) up or down. Thus, the classification seemed as follows:

$27 - 18.32 = \text{app. } 9 \rightarrow$	0 – 9 errors, <i>good readers</i>
	10 – 27 errors, <i>mild reading disability</i>
$27 + 18.32 = \text{app. } 45 \rightarrow$	28 – 45 errors, <i>dyslexia</i>
	46 errors or more, <i>severe dyslexia</i>

5.4 Training Procedures and Participants of the Research

The sample (n = 98) of this research comprised students from Helsinki City College of Technology (Helsinki) and Sámi Education Institute, who participated in two remedial training experiments. The reading

of the test group (n = 6) and the control group (n = 3) selected from the sample were studied for one study year. The test group was given 20 hours of remedial training for dyslexia while the control group was not. The research group (n = 37) in which the diagnostic method was tested comprised of students from Liperi and Joensuu Vocational Schools.

The influence of the Remedial Morsels training material on students' reading performances was studied through two remedial training experiments: at Helsinki City College of Technology (Helsinki) in 2001-2002 and at Sámi Education Institute in Inari in 2008-2009. The first phase of the process consisted of the evaluation of students' reading skills. P- and L-type readers were distinguished from the group the evaluation recognized as students with reading disability. The reading skill evaluation and classification into P- and L-type readers were done by using the aforementioned classification system. Next, P- and L-type readers were divided into two groups: test and control groups.

5.5 Evaluation of the Influence of the Remedial Training Periods

Both training periods included 20-hours' training with Remedial Morsels training program. The control group did not participate in remedial training. After the training periods, final measurements were done among the test and control groups. The measurement was identical with the initial measurement. Remedial training followed typical arrangements of a classic exam situation. At the final phase, the results from the final measurements were analyzed and compared to the initial results. When analyzing the results, the purpose of training was considered carefully: L-type readers were expected to become slower readers, which means that slower reading speed was considered positive development. The principle was used when calculating the relative change in reading speed in L-type readers between the initial and final measurements. The results were evaluated through statistical analysis and students' narratives.

A classic test arrangement was applied in this study: the research participants' were tested before and after the experiment. In these kinds of test situations, the observations are not independent but it is more relevant to refer to paired samples. As the number of participants was relatively low in this research, non-parametric measurements were considered suitable for analyzing the data. Wilcoxon's test was applied for measuring the statistical significance of the results (see Gibbons, 1993).

In practice, this meant that the same dependent or paired samples had different experiments and the influence of the experiment was compared. The test

and the experiment group had the same initial and final tests, one before the remedial training and one right after the training period. The test group had remedial training while the comparison group had not. In addition, the functionality of the diagnostic method for dyslexia and the difficulties faced by students in mechanical reading were studied.

7. RESULTS

The overall research results were obtained by combining the research groups from the two remedial training periods. The final test group consisted of six students of whom two had P-type dyslexia (one men and one women) and four had L-type dyslexia (all men). The control group had three students of whom one had P-type dyslexia (man) and two had L-type dyslexia (women).

During the intervention, the total number of errors decreased by 58 errors (22.9%) in the test group: P-type errors decreased by 26 errors (21.1%) and L-type by 32 errors (24.6%). Respectively, the decrease in the control group was eight errors (7.1%): P-type errors decreased by nine errors (7.1%) and L-type errors increased by one error (1.6%). The result was significant in the test group ($p < .05$).

The linear figure 1 shows student-specific change in the total number of reading errors. Letters P and L refer to the reader type. In the test group, everyone's errors decreased. Interestingly, also the errors of the test group member number 9 decreased significantly although this participant did not have remedial training. The test group member number 1 stands out because of the high number of reading errors.

The percentual improvement in reading speed in the test group was 9 % whereas the reading speed in the control group got worse by 3.6 %. Figure 2 illustrates the changes in reading speed. When reading the figure, it is worth remembering the difference between P- and L-type readers: the increase in reading time in L-type readers was interpreted as a positive change. The test group member number 1 (a P-type reader) stands out clearly being a considerably slow reader. The change in reading speed in the test group was statistically significant ($p < .05$).

Research results were also evaluated through students' own experiences. This happened by interviewing two students by phone about two years after the remedial training period had taken place in Inari. The interview was to find out the students' perceptions of the influence of the remedial training period during the past two years. The students highlighted

Figure 1. STUDENT-SPECIFIC CHANGES IN THE TOTAL NUMBER OF READING ERRORS (LINEAR)

Figure 2. THE CHANGE IN READING SPEED (LINEAR)

the strengthening of their own skills and becoming aware of the nature of the problem. The female interviewee described her relief when finding out the reasons of dyslexia. She had found the training useful: the fluency of her reading had improved and she had become encouraged to consider even university-level studies.

Although this study did not involve any control over the stability of changes in reading performances, this issue was discussed with students: their experiences were considered important. According to the student interviews, the remedial training period had had a long-lasting positive influence in their reading. Especially, increased fluency in reading was considered stable.

8. DISCUSSION

According to the results, the exercises that were meant to activate the weaker cerebral hemisphere functioned as planned. The number of typical errors—P-type errors in P-type readers and L-type errors in L-type readers—decreased in the test group 30.1 %. The change occurring in the test group was more evident in L-type than P-type errors. Moreover, one P-type reader developed significantly while the

other did not at all despite the intervention. Based on this result, it seemed that L-type exercises worked better than exercises aimed at P-type readers. On the other hand, it is also noteworthy that positive development occurred also in the control group especially in their typical errors as their decrease was 22.1 %. Reading speed had a clear difference between the test and control group: all members of the test group made improvement in reading speed. This result showed that the exercises had an especially positive influence on reading speed. In the control group, reading speed either remained the same or got worse.

Yet, the influence of the intervention and the results must be interpreted with caution. The sample of this study is relatively small and is based on a one-study year's follow-up in each institution. When it comes to the control group, Wilcoxon's test does not show statistically significant improvement due to the low number of units. Therefore, there is a reason to read the results concerning the control group with caution and consider them only suggestive. What is interesting in the results is the difference between students in these two institutions participating in the study. The differences concern for example the sizes of these institutions, geographical location, gender distribution, and occupational studies provided by the institutions. In Helsinki, the research group had

mainly men and in Inari mainly women which partly explain the differences between the reading performances in these groups.

The results also showed that the control group made somewhat less reading errors in the final measurement. Why was that although they did not participate in the remedial training? Perhaps some factor had influenced on the measurement, for example the level of students' alertness. On the other hand, the control group may also have improved because they studied normally during the research period. Remarkably, neither of the control group members could have been classified as P- or L-type readers after the final measurement; in other words, their status had changed when it came to dyslexia. All of them had been relatively close to the limits of the classification and thus, changes may have taken place due to the aforementioned reasons in these two measurements.

9. CONCLUSION

Concern over upper secondary education students' low reading skills is justified. This study alone showed that over a third of the students had severe reading disability in mechanical reading. There is also research proving that reading disability varies by gender: boys have considerably more difficulties already in elementary education than girls (Holopainen & Savolainen, 2005; Lundström, 2009; Savolainen, Ahonen, Aro, Tolvanen, & Holopainen, 2008). Various evaluations of the number of men with dyslexia in relation to women vary from two to five times more (Snow, Burns, & Griffin 1998). The results of this study support this notion. Among students from Helsinki, about two third and, among the whole research group, over a half were diagnosed with reading disability.

There are also studies on the influence of reading disability on youngster's educational and occupational choices. International research emphasizes the distrust in one's ability to perform academic studies and thus many young people with dyslexia are likely to choose a practice-oriented profession. The perceived difficulties in reading may be the reason why one considers only certain types of professions whereas becoming aware of various possibilities was connected to positive attitude and expectations toward the future (see e.g., Ingelsson, 2007; Taylor & Walter, 2003.) Difficulties do not confine themselves only among the young and adults who choose lower levels of education. Quite a surprising research result was reported from The United Arab Emirates where dyslexia was discovered in almost one fifth of female stu-

dents in one university (Aboudan, Eapen, Bayshak, Al-Mansouri & Al-Shamsi, 2011).

Alongside the method itself, the remedial training of dyslexia should focus also on persons' own hopes and expectations concerning the outcome. A new medical research proves that patients' own expectations, thoughts, and unconsciousness affect the effect of treatment. Placebo has managed to alleviate symptoms of Parkinson's disease, such as tremble, muscle stiffness, and slowdown of movements (Fuente-Fernández et al., 2001). The studies have even shown that treatments have had a positive influence even if patients were told that their daily dose does not include medicine but placebo (Kaptchuk et al., 2010). Likewise, the person's own motivation has proven significant to the effect of remedial training of dyslexia (Bakker, 2006).

Results of this training experiment give reason to make interpretations. For example, the actual effect of P-type exercises on activating the weaker cerebral hemisphere remains somewhat vague. Similar results have been reported in few other studies (see Bakker et al., 1990; Goldstein & Obrzut, 2001). Likewise, the decrease of reading errors in the control group might remain unsolved. Because of the smallness of the control group, the chance of coincidence cannot be totally excluded.

There are not any previous reports about remedial training experiments in adults with dyslexia that would be based on the brain balance model. As this study is the first of its kind, it provides new information about reading disability in adults. The suitability of the model for remediating adults can be taken with hopeful caution. The statistically significant decrease in the total number of reading errors and improvement in reading speed in the test group gives reason to assume that Bakker's types of dyslexia exist and are recognizable not just among preschool and school children but also among adults with dyslexia.

To conclude, when it comes to the remedial training of adults with dyslexia, this study provided encouraging findings according to which dyslexia can be remedied in adulthood. The study also implied that the consequences of the problem occur in adults roughly in two ways: while some adults with dyslexia want help and are ready to work to conquer the problem and to gain better reading skills, some others tend to hide the problem and select tasks that do not require fluent reading skills, especially in working life. Therefore, it seems that in adulthood, the person's own motivation and willingness to receive help and remedial training are the pivotal factors for the success of training.

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