DOSSIER:

The Impact of Linguistic Factors on Dyslexia - Implications for Foreign Language Learning

Jeannette Dietz

Figure 1: Celebrities and dyslexia (cartoon from Davis 2001: 1)[1]

---

[1] Translation of the cartoon (by the author of the dossier): "Listen, Bodean… if this test shows that you are dyslexic, it does not mean that you are stupid!" – "I see! Then tell me an intelligent man who was dyslexic!" – "Albert Einstein!" – "Now, tell me twenty more!"

Dossier: The Impact of the Linguistic Factors on dyslexia - Implications for Foreign Language Learning

Contents

1   Introduction

Reading is a complex skill that the majority of us has learnt quiet easily. Nevertheless, there are up to 20 % of children who have severe difficulties to learn written language (Satz et al. 1978 quoted by Klicpera and Gasteiger-Klicpera 1995). About half of them suffer from dyslexia, which is a specific reading disorder the reason of which is neither educational nor intellectual. However, dyslexia concerns not only children but adults too.

According to Loughlin, Fitzgibbon, and Young (1994), at least one of 25 adults is dyslexic.

A detailed view of the frightening high numbers shows that the incidence rates of dyslexia vary largely depending on countries or languages. Whereas 10 % of children in the USA are dyslexic (Satz et al. 1978 quoted by Klicpera and Gasteiger-Klicpera 1995), there are only 1 % in Japan (Macita 1968 quoted by Witruk 1994). This dossier will explore reasons for this varying incidence by reviewing several cross-linguistic studies on reading acquisition and dyslexia.

In order to do this, the text will first introduce the topic of dyslexia, inform about causes, symptoms and sketch several theoretical models for better understanding. Following that, it will give a detailed view of the incidence rates of reading disorders in different countries. Then, the main part of the article will deal with the dependence of dyslexia on specific language systems, which includes both a comparison of English-German and English-Chinese. Finally, the article will discuss consequences for foreign language acquisition in dyslexics.

2 What Is Dyslexia?

Dyslexia is "… a severe difficulty with the written form of language independent of intellectual, cultural and emotional causation." (Thompson and Watkins 1990 quoted by Loughlin et al. 1994: 4). Although there is no consensus in the definition of dyslexia, most definitions focus on the discrepancy of intelligence, age or education and written language skills (Loughlin et al. 1994). "Dyslexia is defined as reading at a level that is significantly below *expected* reading level… " (Siegel 1992: 618).

Several scientists have criticized these "discrepancy definitions" and introduced alternative models (for example Siegel 1992; Wright and

Groner 1992; Mc Loughlin et al. 1994). One of these models concentrates on the underlying cognitive processes (Loughlin et al. 1994). According to Loughlin et al. (1994) dyslexia is due to a problem with information processing and deficits in short-term memory and therefore defined as a

> "…syndrome characterised by a variety of symptoms such as problems with short-term memory tasks, left/right confusion, late achievement of developmental milestones and familial factors…" (Miles 1983 quoted by Loughlin et al. 1994: 5).

In addition to the explanation of dyslexia in the model of Loughlin et al. (1994), other authors discuss deficits in visual and three-dimensional perception (Oehrle, 1975) or phonological deficits (Klicpera and Gasteiger-Klicpera (1993) as underlying secondary causes of dyslexia. Secondary causes are psycho-functional disorders that underlie dyslexia and that are due to primary causes. The hypotheses about the latter range from genetic, neurological and social reasons to multiple combinations of these reasons (Jordi 1998).

As a result of the variety of causes, dyslexia is often divided in subtypes. Most authors distinguish between the *visual* and *auditive dyslexia* (Wright and Groner 1992). The visual dyslexic has visual and three-dimensional perception deficits that involve problems with sequences, differentiation of symbols and therefore problems in reading, writing and spelling. The auditive dyslexic has major problems in phonological perception that have impact on differentiation of sounds, detecting rhyme, pronunciation and therefore on reading and writing (Jordan 1977).

3 Language Acquisition Models

To understand the different factors that evoke or increase dyslexia one has to understand how reading acquisition works. A review of the

literature about written language acquisition models leads to the conclusion that there is no unique model, but several.

The most often quoted model is the phonological process or awareness model (see for example Landerl, Wimmer, and Frith 1997; Wolf et al. 1994; Wagner and Barker 1994). Phonological processes, especially phonological awareness, are important to distinguish sounds. Therefore a common conclusion in dyslexia research is that deficits in phonological processing underlie the dyslexia (Landerl, Wimmer, and Frith 1997; Wolf et al. 1994; Wagner and Barker 1994). Phonological deficits are seen as universal factors in dyslexia (Landerl et al. 1994). Wagner and Barker (1994) restrict the ambit of the theory. According to them, the phonological processing theory applies, above all, for all alphabetic orthographies like most European languages. Alphabetic languages follow the principle that graphemes represent abstract phonemic units (Landerl et al. 1994). Therefore reading acquisition in alphabetic language systems is equivalent with the acquisition of the phoneme-grapheme correspondence (Landerl et al. 1994).

The working memory is closely related to the phonological processes, because phonological information like letters or words is stored in the working memory and used to understand the whole word or sentence.

In contrast to the idea of deficits in phonological processes, a few authors have mentioned the importance of orthographic processes for reading and spelling (Sprenger-Charolles, Siegel, and Bonnet 1998; Wagner and Barker 1994; Geva and Willows 1994).

> "Orthographic coding may be defined as the ability to represent the unique array of letters that defines a printed word, as well as general attributes of the writing system such as sequential dependencies, structural

redundancies, letter position, frequencies, and so forth." (Vellutino, Scanlon, and Tanzman 1994 quoted by Wagner and Barker 1994: 247).

Wagner and Barker (1994) mention an everyday example to show evidence for orthographic processing. When we do not know how to spell a word and we cannot look it up in a dictionary, then we often try to write the word down and look at it to decide whether the spelling looks right or not. This orthographic strategy uses the visual image of the word written down and compares it to the stored orthographic image (Wagner and Barker 1994).

Finally, there are models of reading acquisition that combine different processes. For example Seymour (1990, 1994 quoted by Sprenger-Charolles 1998) assumes that logographic and phonological processes can coexist whereas Frith (1986, quoted by Sprenger-Charolles et al. 1998) supposes a sequence of different stages: First, children in kindergarten are in the logographic stage, they read by viewing a common whole word as a pictogram (Seymour 1990, 1994 quoted by Sprenger-Charolles et al. 1998). Second, children who begin to learn reading are in the phonological stage and use phonological units like letters and morphemes to read. The final stage is the orthographic stage where children read by comparing sections of the written language with their interior lexicon.

However, there is a number of authors who doubt on the importance or even existence of logographic or orthographic processes (for further reading see Sprenger-Charolles et al. 1998).

4 Cross-National Incidence

Most authors working in the field of reading acquisition and especially dyslexia come from English speaking countries. Therefore most studies are conducted with English speaking people and concern English language

acquisition or English dyslexics. Only a few studies are conducted in other countries and even less have focussed on cross-national differences.

The reported incidence numbers of dyslexia are mainly based upon estimates. The incidence of dyslexia in the USA and Great Britain is estimated at about 10 % (Satz et al. 1978 quoted by Klicpera and Gasteiger-Klicpera 1995; Busse 1997). German studies report fewer incidences of 5 to 7 % (Valtin 1989 quoted by Wolf et al. 1994). In Italy only about 3 % of people are dyslexic (1,34 to 5,04 % range) (Morchio, Ott and Persenti 1989 quoted by Wolf et al. 1994). Finally, a Japanese study reports the lowest incidence of dyslexia of just 1 % (Macita 1968 quoted by Witruk 1994).

On the one hand, Wolf et al. (1994) emphasize that these ranges of incidence do not necessarily support the hypothesis of the influence of language or orthographic systems on reading acquisition. On the other hand, Lindgren 1985 (quoted by Witruk 1994) could empirically verify this hypothesis.

5 Linguistic Factors

The varying incidence among different countries has entailed several cross-linguistic studies to investigate the influence of culture, language and educational system. This dossier aims only to focus on the impact of the language on dyslexia.

There are only a few studies in the last ten years that have examined the relationship between language and dyslexia. Until 1980, very little was known about this relationship (Garfield 1980).

The two main approaches dealing with linguistic factors in reading acquisition study either the influence of the regularity of written language system or the difference of alphabetic and idiographic or logographic language systems. The first approach analyses the impact of orthographic consistency on phonological processing. The second approach investigates reading in alphabetic versus logographic systems and their impact on visual and phonological processing.

5.1   The Impact of Orthographic Consistency on Dyslexia (English-German Comparison)

The varying incidence of dyslexia among different countries with alphabetic language systems led to the idea that the regularity of orthography could have an impact on reading acquisition and, thereby, on dyslexia. A current study conducted by Landerl et al. (1997) investigates this impact by comparing English and German dyslexics on many different tasks.

In German the sounds in the spoken language (phonemes) and the letters in the written language (graphemes) correspond each other closely one-to-one. German orthography, thus, has a quite high degree of orthographic regularity or consistency. In contrast to German, English has a low degree of orthographic consistency. English has an opaque or "deep" orthography where the phoneme-grapheme correspondence is irregular (Foorman 1994; Landerl et al. 1997). The inconsistency of English phoneme-grapheme correspondence is most striking for vowels: the 5 vowels correspond to 19 sounds, whereas in German 1 vowel represents 1 sound (Wolf et al. 1994). Landerl et al. (1997) illustrate this inconsistency with the letter *a*. While in German the grapheme *a* stands for the same sound in *Ball*, *Katze* and *Hand*, it is pronounced differently in English: *ball*, *cat* and *hand*.

Landerl et al. (1997) could show that the degree of orthographic consistency has impact on dyslexia. They assumed that the higher the degree of inconsistency is the higher are the demands on phonological processing and the higher is the degree of dyslexia. They compared English and German dyslexics on several tasks, including reading words of high and low frequency, reading non-words, and a spoonerism task, which is a language and age independent dyslexia test. They could show evidence for their hypothesis that English dyslexic children "…suffer from much more severe impairments in reading than the German dyslexic children." (Landerl et al. 1997: 328). The kind of reading errors indicates that the difficulties are due to the opaque phoneme-grapheme correspondence in English. Therefore the findings support the theory of phonological decoding deficits in dyslexic children (Landerl et al. 1997).

The differences between English and German dyslexics show that the orthographic system, especially the irregularity of phoneme-grapheme correspondence has an impact on reading acquisition and dyslexia.

5.2   The Impact of Alphabetic and Logographic Language System on Dyslexia (English-Chinese Comparison)

In addition to research of the (ir)regularity of alphabetic orthographies, cross-linguistic research on dyslexia also focuses on the difference of alphabetic and logographic language systems and their impact on reading acquisition.

The low incidence of dyslexia in China and Japan (Macita 1968 quoted by Witruk 1994) led to the hypothesis that learning to read logographic languages is easier for people who have phonological deficits like dyslexics are supposed to have.

The Chinese writing system seems to be a pictographic system in which each graphic symbol represents a word, but that is wrong (Jackson, Lu, and Ju 1994). Modern Chinese is a logographic system in which the characters represent only syllables or little meaningful parts of a word (morphemes). Most Chinese characters consist of a semantic and a phonetic radical. The semantic radical provides often some semantic information, whereas the phonetic radical provides information on how to pronounce the syllable.

In contrast to the assumption that Chinese does not required phonological decoding, it does (Jackson et al. 1994). However, the way through which the phonological information is available differs from alphabetic systems. In Chinese, graphic information is available first in the identification of the character, which could be seen as an indicator that visual decoding is more important in Chinese than phonological decoding. However, semantic information is only available when phonological information available. That means that phonological processing is still required, but in a later stage of decoding the word.

Hoosain (1991 quoted by Jackson et al. 1994) supports the idea that visual processing is more important in Chinese because "…Chinese words might be more likely than English words to remembered in terms of a visual code rather than, or in addition to, a phonological code." (Jackson et al. 1994: 84). Moreover, reading Chinese seems to be an activity that is more dominated by the right hemisphere than reading alphabetic languages. The latter have a left hemisphere advantage (Hoosain 1991 quoted by Jackson et al. 1994). According to Davis (2001), the main deficit of dyslexic people is their main chance because they are right-hemisphere dominated. That means on the one hand, they are more creative and good at complex visual stimuli, and on the other hand, they have severe visual perception problems with symbols and therefore their difficulties to read alphabetic systems. It could be that this right-

hemisphere dominance of Chinese reading activity contributes to the little incidence of dyslexia in China.

However, the study of Jackson et al. (1994) concludes that the large differences in the language systems of Chinese and English do not have such a big effect on the reading acquisition one might think. The major differences between Chinese and English reading are found for words of low frequency (Jackson et al. 1994). Unfortunately, Jackson et al. (1994) did not examine dyslexic but normal readers, therefore the conclusion whether Chinese might be easier for the dyslexic reader cannot be given.

The mentioned findings in this chapter suggest that reading Chinese might be easier for dyslexic people, but only in the case that their dyslexia is due to deficits in phonological processing and not due to deficits in visual processing. However, there is empirical evidence that the difference between reading a logographic language (such as Chinese) and an alphabetic language (such as English) is much smaller than the scientists originally believed.

6 Consequences for Second Language Learning

The preceding chapters have shown that the reading process is not the same in all languages. Universal and language specific factors have been discussed, especially with the focus on the dyslexic reader.

> "On the one hand, reading any orthography probably requires orthographic-phonological connections, although specific orthographies may differ in the units of orthography and units of phonology involved in forging connections." (Berninger 1994: 13).

All mentioned studies examined the reading process in the mother tongue of the reader. Nevertheless, conclusions seem to be made for foreign language reading of dyslexics.

English is the most frequently provided and learnt second language in Europe (Pufahl, Rhodes, and Christian 2000). However, it seems to be one of the most difficult languages for dyslexic people. Dyslexics should choose Italian, Spanish or Finish rather than English or Danish (see Figure 2). Even German which commonly has the reputation to be very difficult should be easier to learn for dyslexic people than English.

Consistent orthographies (almost one-to-one correspondence of phonemes and graphemes)
= easier to learn for dyslexic people:
Italian, Spanish, Finnish, Hungarian, Serbo-Croatian

In between: *German, French*

Inconsistent ("deep"/opaque) orthographies (no regular correspondence of phonemes and graphemes: the same grapheme can be pronounced in many different ways and the contrary, the same phoneme corresponds to many different graphemes)
= more difficult to learn for dyslexic people:
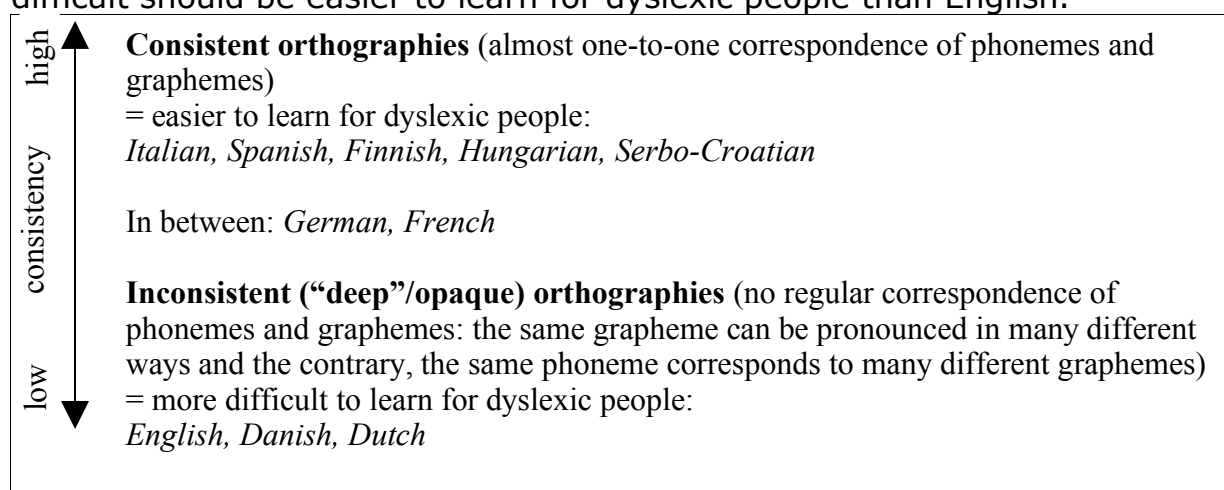*English, Danish, Dutch*

(consistency: high ↑ — low ↓)

Figure 2: Languages listed by their degree of consistency (see Foorman 1994; Berninger 1994; Wolf et al. 1994; Landerl et al. 1997; Sprenger-Charolles 1998)

Apart from the findings about orthographic consistency, the results of comparisons of alphabetic and logographic systems do not show clear evidence that Chinese or other logographic language systems could be easier to learn than alphabetic ones by dyslexic people. Therefore, the suggestion of this article would be to learn a second language that uses the same alphabetic system as the mother tongue rather than to learn a logographic or another unfamiliar language system.

7 Conclusion

As the article has shown, reading acquisition depends on both universal factors and language system specific factors. Language system and orthography contribute in several ways to the development of dyslexia. On the one hand, orthographic inconsistency reinforces dyslexia, which could be supported by empirical data (Landerl et al. 1997; Wolf et al. 1994). On the other hand, there are contradictory findings about the influence of the language system (alphabetic or logographic) on dyslexia, which suggest further research in that area should be conducted.

Most dyslexic people have their main deficits in phonological processing (auditive dyslexia). They have huge problems to learn the phoneme-grapheme correspondence in a language. Therefore irregularity in this correspondence (orthographic inconsistency) makes their difficulties worse. In addition to that, the hypothesis that logographic language systems are easier to learn for dyslexics with phonological deficits can not be verified. It remains uncertain whether they might profit from logographic language system like Chinese. Certainly, dyslexics with (additional) deficits in visual processing or working memory have more problems to learn a visually complex logographic system than people with auditive dyslexia only.

For these reasons, it is clear that dyslexic people should choose their second language carefully. The learning of orthographically consistent languages as Italian or Spanish should be more appropriate for dyslexics than the learning of the orthographic inconsistent English language. In addition to that, the dyslexic should feel more comfortable if she or he learns a second language that is based on familiar letters than a language that is based on a distinct alphabetic system.

8 Bibliography

Berninger, V.W. 1994. "Introduction to the varieties of orthographic knowledge I: Theoretical and developmental issues." In V.W. Berninger (Ed.). *The varieties of orthographic knowledge 1: Theoretical and developmental issues* (pp. 1-25). Dordrecht; Boston; London: Kluwer Academic Publishers.

Busse, D. (1997). "The Incidence of Dyslexia." Available at: http://www.dcs.gla.ac.uk/~bussed/PWSN_info_service/dys_incidence.html (downloaded at 2002, May 13).

Clark, M.M. 1979. *Reading difficulties in schools*. London: Heinemann Educational Books.

Davis, R.D. 2001. *Legasthenie als Talentsignal*. München: Droemer Knaur.

Frith, U. 1986. "A developmental framework for developmental dyslexia." *Annals of Dyslexia* 36: 69-81.

Garfield, E. 1980. "Dyslexia: To Read Or Not To Read." *Essays of an Information Scientist* 4/10: 409-413. Available at: http://www.garfield.library.upenn.edu/essays/v4p409y1979-80.pdf (downloaded 2002, May 13).

Geva, E. and Willows, D. 1994. "Orthographic knowledge is orthographic knowledge is orthographic knowledge." In V.W. Berninger (Ed.). The varieties of orthographic knowledge 1: *Theoretical and developmental issues* (pp. 359-380). Dordrecht; Boston; London: Kluwer Academic Publishers.

Jackson, N.E., Lu, W.-H., and Ju, D. 1994. "Reading Chinese and reading English: Similarities, differences, and second-language reading." In V.W. Berninger (Ed.). *The varieties of orthographic knowledge 1: Theoretical and developmental issues*. Dordrecht; Boston; London: Kluwer Academic Publishers: 73-109.

Jordan, D.R. 1977. *Dyslexia in the classroom*. Colombus (Ohio): Charles E. Merrill Publishing Company.

Jordi, A. 1998. "Legasthenie." Available at http://www.cp-zentrum.ch/seiten/3_angebo/4_medien/seiten/lega.html (downloaded 2002, April 12).

Klicpera, C. and Gasteiger-Klicpera, B. 1993. *Lesen und Schreiben-Entwicklung und Schwierigkeiten: Die Wiener Längsschnittuntersuchungen über die Entwicklung, den Verlauf und die Ursachen von Lese- und Rechtschreibschwierigkeiten in der Pflichtschulzeit*. Bern: Hans Huber Verlag.

Klicpera, C. and Gasteiger-Klicpera, B. 1995. *Psychologie der Lese- und Schreibschwierigkeiten: Entwicklung, Ursachen, Förderung*. Weinheim: Beltz Psychologie Verlags Union.

Landerl, K., Wimmer, H., and Frith, U. 1997. "The impact of orthographic consistency on dyslexia: A German-English comparison." *Cognition* 63: 315-334.

Lindgren, S.D. et al. 1985. "Cross-national comparisons of developmental dyslexia in Italy and the United States." *Child Development* 2: 1404-1416.

Macita, K. 1968. "The rarity of reading disbility in Japanese children." *American Journal of Orthopsychiatry* 1: 599-613.

McLoughlin, D., Fitzgibbon, G., and Young, V. 1994. *Adult Dyslexia: Assessment, Counselling and Training*. London: Whurr Publishers.

Miles, T.R. 1983. *Dyslexia. The pattern of difficulties*. St. Albans: Granada Publishing Co.

Oehrle, B.D. 1975. *Visuelle Wahrnehmung und Legasthenie*. Weinheim: Beltz Verlag.

Pufahl, I., Rhodes, N.C., and Christian, D. 2000. "Foreign language teaching: What the United States can learn from other countries." Available at: http://www.cal.org/ericcll/countries.html (downloaded 2002, May 13).

Satz, P., Taylor, H.G., Friel, J., and Fletcher, J.M. 1978. "Some developmental and predictive precursors of reading disabilities: A six-year follow-up." In A.L. Benton and D. Pearl (Ed.) *Dyslexia: An appraisal of current knowledge*. New York: Oxford University Press.

Seymour, P.H.K. 1990. "Developmental dyslexia." In M.W. Eysenck (Ed.). *Cognitive psychology: An international review* (pp.135-196). Chichester: Wiley.

Seymour, P.H.K. 1994. "Un modèle du développement orthographique à double fondation." In J.P. Jaffré, L. Sprenger-Charolles, and M. Fayol (Ed.). *Lecture/Écriture: Acquisition; Les actes de La Villette* (pp. 57-79). Paris : Nathan.

Siegel, L.S. 1992. "An evaluation of the discrepancy definition of dyslexia." *Journal of Learning Disabilities* 25/10: 618-629.

Sprenger-Charolles, L., Siegel. L.S., and Bonnet, P. 1998. "Reading and Spelling Acquisition in French: The role of phonological mediation and orthographic factors." *Journal of Experimental Child Psychology* 68: 134-165.

Thompson, M.E. and Watkins, E.J. 1990. *Dyslexia: A teaching handbook*. London: Whurr.

Vellutino, F.R., Scanlon, D.M., and Tanzman, M.S. 1994. "Components of reading ability: Issues and problems in operationalizing word identification, phonological coding, and orthographic coding." In G.R. Lyon (Ed.). *Frames of reference for the assessment of learning disabilities: New views on measurement issues* (pp. 279-332). Baltimore, MD: Brookes.

Wagner, R.K. and Barker, T.A. 1994. "The development of orthographic processing ability." In V.W. Berninger (Ed.). *The varieties of orthographic knowledge 1: Theoretical and developmental issues* (pp. 243-276). Dordrecht; Boston; London: Kluwer Academic Publishers.

Witruk, E. 1994. *Fremdsprachenerwerb bei Legasthenikern.* Antrag zur Begutachtung bei der DFG eingereicht. Universität Leipzig, Institut für Angewandte Psychologie und Sozialpsychologie, Tieckstr. 2, 04275 Leipzig (Germany).

Wolf, M., Pfeil, C., Lotz, R., and Biddle, K. 1994. "Towards a more universal understanding of the developmental dyslexias: the contribution of orthographic factors." In V.W. Berninger (Ed.). *The varieties of orthographic knowledge 1: Theoretical and developmental issues* (pp. 137-171). Dordrecht; Boston; London: Kluwer Academic Publishers.

Wright, S.F. and Groner, R. 1992. "Zur Frage der Definition und Abgrenzung von Lesestörungen." *Schweizerische Zeitschrift für Psychologie* 51/1: 15-25.