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The nature of reading difficulties among inmates in juvenile institutions

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Abstract. Dyslexia is assumed to be frequent among inmates in prisons and in juvenile institutions. However, it remains unclear whether the literacy difficulties observed are really dyslexic in nature. Seventy inmates in juvenile institutions were studied. In addition to literacy skills, the assessment included phonological skills, school attendance, cultural background, and self-esteem. Dyslexia in the sense of decoding problems related to phonological deficiencies was observed in 11% of the cases. Most of the inmates with literacy difficulties had a background, from infancy and onwards, characterized by severe social and emotional problems, interfering with positive experience of literacy and the literate culture. However, these sub-optimal experiences of the literate culture do not imply dyslexia. From this perspective, it is unlikely that dyslexia is a determining factor of delinquent behavior.

Key words: Dyslexia, Juvenile delinquents, Phonology, Reading and writing difficulties, Socio-emotional factors

Introduction

Several studies of inmates of juvenile institutions and prisons have shown that reading and spelling problems are more common in these groups than in the general population (Alm & Andersson, 1997; Dalteg et al., 1997; Newman, Lewis & Beverstock, 1994; Samuelsson, Gustafson, Herkner & Lundberg, 2000; Samuelsson, Herkner & Lundberg, 2003; Sarnecki, 1991; Snowling, Adams, Bowyer-Crane & Tobin, 2000). In an earlier paper (Svensson, Lundberg & Jacobson, 2001) we reported that more than 70% of the inmates of Swedish institutions for juvenile delinquents showed problems with reading or spelling.

These results are depressing considering the increasing importance of literacy skills in current knowledge society with the rapid growth of information technology and the increasing dependence on text and symbols in working life. Poor literacy skills will certainly make the re-socialization of young delinquents more difficult and increase their risks of permanently occupying a marginalized position in society with long-term unemployment and minimal participation in the democratic process. An important

strategic element in the treatment of young delinquents would then be careful, intense and competent remedial instruction of reading and writing. Meaningful instructional intervention, however, must rest on deep insights into the nature of the literacy problems.

A common assumption in the public debate and also expressed in some published research (Alm & Andersson, 1997; Crawford, 1996; Kirk & Reid, 2001; Moody, Holzer, Roman, Paulsen, Freeman, Haynes & James, 2000) is that the literacy problems observed in prisons and juvenile institutions are primarily of a dyslexic nature. This assumption seems to imply that dyslexia might even be an important cause of delinquency. A typical course of development would then be that a child, suffering from constitutionally based difficulties of learning to read, reacts with aggression and even antisocial behavior on the failure of acquiring an important and highly valued skill such as reading. According to this argument, this early and strong frustration then opens up the route, which, in serious cases, ends with antisocial and criminal behavior and imprisonment.

Dyslexia can be defined as a complex neuro-developmental disorder with a genetic and constitutional background. Individuals with dyslexia have problems with reading and writing but also show other signs far beyond the written language. An abundance of research has demonstrated that phonological weakness is the core factor in dyslexia (for a review, see e.g. Snowling, 2000). According to Lundberg (1999) "dyslexia is a disturbance in dealing with the code of the written language based on a deficit in the phonological system of the spoken language" (p. 10). The phonological weakness, which may have a genetic background and a neurobiological substrate, is manifested in unusual difficulties with the alphabetic code, resulting in slow, laborious and error-prone recognition of written words. Thus, word decoding problems rather than comprehension difficulties are the hallmark of dyslexia. Comprehension problems are in most cases secondary consequences of poor word recognition. This conception of dyslexia has guided the research presented in this article.

The significant correlation between early reading problems and later conduct disorders observed in a longitudinal study by Fergusson and Lynskey (1997) would support a causal interpretation implying that dyslexia may be a cause of later adjustment problems. However, when data on early social adjustment in pre-school ages were taken into account, the direct association between reading failure and conduct disorder disappeared. The adolescent conduct disorders could be explained by very early behavioral problems occurring long before reading acquisition. The early socio-emotional problems also had a negative influence on learning to read. Thus, the correlation between reading problems and later conduct disorders were found to be

spurious. This pattern of causality might suggest a different educational strategy in the treatment of juvenile delinquents as compared to the case when dyslexia is supposed to be a primary cause of delinquent behavior.

Our line of reasoning thus implies that dyslexia is a rather specific or circumscribed weakness, which is often expressed in reading problems. By carefully assessing an individual's phonological processing capacity, it might be possible to capture the basic mechanism involved in dyslexia (see Frith, 1999; Lundberg, 1999).

Regardless of the exact neurobiological nature of the disturbance, there is no compelling reason to assume that individuals who develop antisocial behavior or conduct disorders would be more vulnerable or more prone to develop dyslexia as well. Thus, we assume that dyslexia, in the sense of a basic and circumscribed processing problem, is not more prevalent in the population of juvenile delinquents or adult prisoners than in the normal population. The longitudinal study of Fergusson and Lynskey (1997) gives further support for this assumption.

On the other hand, manifest problems with reading and writing might be caused by a large number of factors outside the phonological module, including socio-emotional problems, lack of motivation, chaotic learning and instructional conditions, cultural deprivation, language problems and such. In an earlier paper (Svensson, Lundberg & Jacobson, 2001) we reported a very high prevalence of problems with reading and spelling among inmates in juvenile institutions (over 70%). However, our diagnostic tools were rather crude and did not permit a more fine-grained assessment of the nature of the literacy problems, including an estimate of the prevalence of pure dyslexia.

The aim of the present study was to obtain a firmer basis for characterizing the literacy situation among juvenile delinquents. Before we present the assessment program and the empirical results, we will give a brief outline of the framework, that guided the selection of assessment procedures of the present study.

Assessment framework

Figure 1 presents an outline of factors involved in reading. The ultimate goal of reading acquisition is to be able to read and understand those texts and written materials that are of use in education, working life, society and private life. Thus, reading comprehension is the main dependent variable in the framework.

A number of proximal and distal factors influence the quality of reading comprehension. Some proximal factors are more directly involved in the reading process whereas frame factors influence the operation of the proximal factors. A necessary prerequisite for reading comprehension is the ability

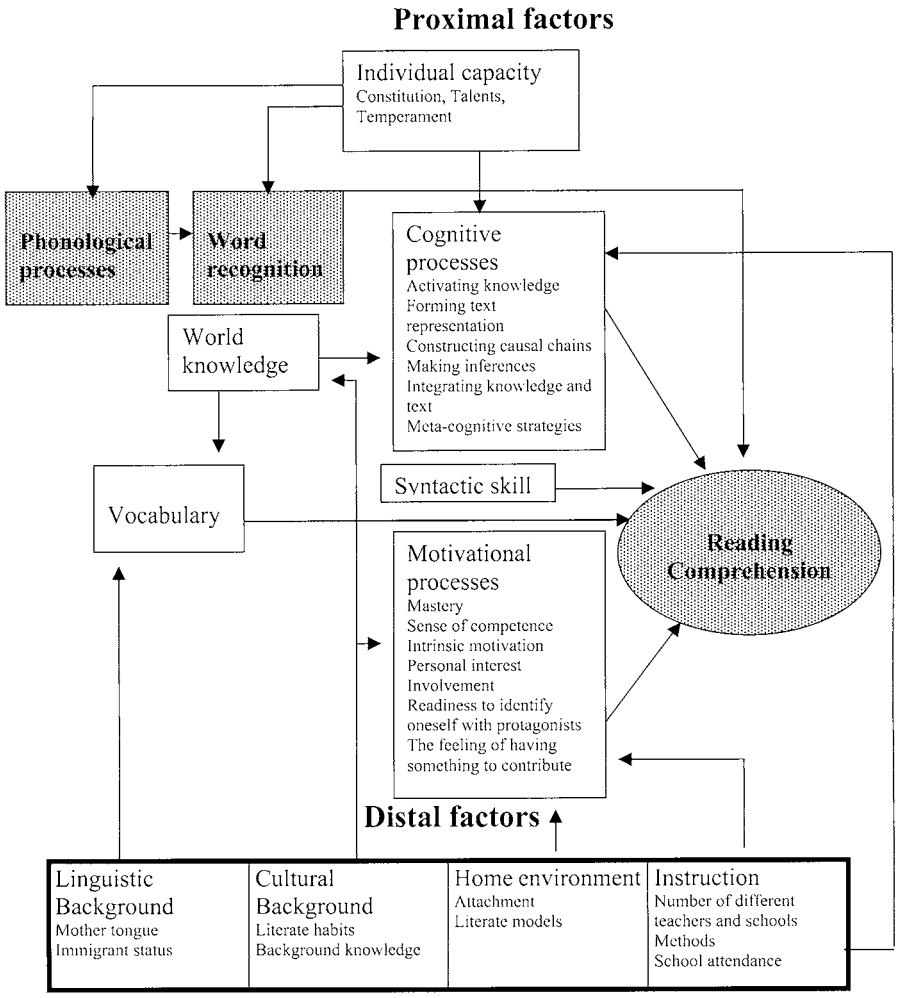

Figure 1. Outline of factors involved in reading.

to quickly and accurately identify the written words in the text. As already emphasized, poor word recognition is typically a dyslexic problem, which most often is related to poor phonological functions. In order to understand a text the reader should also know the meaning of the words in the text. Poor vocabulary is thus a strong limiting factor in reading comprehension. Syntactic skill is another important prerequisite often highly correlated with vocabulary. Other proximal factors are world knowledge including schemas, cognitive processes including meta-cognitive strategies and motivational processes. More general frame factors influencing literacy skills are linguistic and cultural background, educational factors and home conditions.

On the basis of earlier research and common experience we have reason to expect that many inmates in juvenile institutions will suffer from reading problems, sometimes so serious that they run a high risk of being excluded from participation in society, further education and working life. Instead of simply labeling these individuals as dyslexic it seems more constructive to try to find out more specifically what kind of problems they actually have.

Some may show a typical dyslexic profile with pronounced phonological impairment and poor word decoding-whereas others may have a more heavy load of negative linguistic, cultural, social, educational and cognitive problems that can explain their reading disabilities.

Guided by the framework outlined here, the present study attempts to clarify the patterns of factors involved in reading achievement among juvenile delinquents. How common are typical dyslexic profiles? Are phonological deficits typical or are other shortcomings more typical? Do juvenile inmates with pronounced phonological problems differ much from those with adequate phonological skills? Only a thorough understanding of the nature of these problems can help us in designing adequate intervention measures.

An important methodological requirement for answering our questions is the inclusion of a carefully matched group of normal youngsters with the same reading level and age level (for a discussion of this design feature, see also Snowling, 2000).

Method

Participants

Participants were 70 inmates (49 boys and 21 girls) from 5 juvenile institutions in the south of Sweden. Their mean age was 15.9 years (SD = 1.6). In terms of size and type of juvenile inmates the selected institutions were fairly typical of this kind of institution. (A total of 32 juvenile institutions have been established in Sweden). Among the selected institutions, two were gender-mixed, two had only boys and one had only girls.

Almost one third of the juvenile inmates (N = 22) were classified as immigrants as both of their parents originated from another country. Two children who had been adopted by Swedish parents after they had acquired their native language were included in the immigrant category. Most of the inmates classified as immigrants, however, were either born in Sweden or arrived in Sweden at an early age.

The target group was juvenile inmates residing in the selected institutions between November 1998 and September 1999. However, four inmates refused to participate and two inmates were excluded because they were

Table 1. Juvenile inmates distributed by age, gender and immigrant status. Mean age is 15.9 (SD = 1.6).

	Boys		Girls		
Age	Swedes	Immigrants	Swedes	Immigrants	Total
13	1	0	0	0	1
14	9	5	0	2	16
15	6	1	2	1	10
16	12	2	3	4	21
17	8	2	2	2	14
Over 17	1	2	4	1	8
Total	37	12	11	10	70

described as mentally retarded. On some measures there are a few missing cases due to unforeseen escapes or moves from the institutions. A few exceptional cases of uncompleted testing sessions due to lack of endurance also occurred. However, the total picture was a very low attrition rate. In fact, out of a total of 76 individuals, who were asked to participate, 70 remained in the study until the end. Table 1 presents the juvenile inmates by gender, age, and immigrant status.

Reading-level matched comparison group. Sixty-one reading-level-matched controls were recruited from two different elementary and middle schools in the county of Kronoberg. In order to match juvenile inmates on word decoding skills, we used the Wordchains test. In this test participants are instructed to segment strings of words into their constituent words (Jacobson, 1995; a more detailed description of the test is given below). The reading-level group consisted of 6 students from grade 4, 9 students from grade 5, 9 students from grade 6, 9 students from grade 7, 15 students from grade 8 and 13 students from grade 9. The mean age for the comparison group was 13.3 years including 40 boys and 21 girls. The mean age of the juvenile inmates was 16.8 year including 40 boys and 21 girls.

Age-matched comparison group. Forty age-matched controls were recruited from the same elementary and middle schools as the reading-level matched controls. The mean age for the juvenile inmates and the comparison group was the same (15.3 years). The comparison group included 29 boys and 11 girls, and in the group of juvenile inmates there were 31 boys and 9 girls.

Procedure

Since most juvenile inmates had problems with attention and endurance it was important to use assessment instruments that were not time-consuming and that had an intrinsic enjoyment value. The total testing time for each individual amounted to nearly two hours. This period was in some cases divided into several shorter sessions depending on the mood of the participant. This flexibility did not imply variation of the testing procedures. The standard norms in terms of instruction, procedure, support and time limits were carefully followed. The participants in the comparison groups completed three tests (Wordchains, pseudo-word reading and phonological choice) of the total test battery.

Instruments

Reading comprehension. Texts and materials from the IEA Reading Literacy Study were used (Elley, 1994). This study was a comparative study of reading achievement among 9-year-olds and 14-year-olds in more than 30 different countries. For our purpose we selected rather brief passages, which were used as bridging tasks for the two age groups in the original study. Two texts with connected prose (narrative and expository) were selected with a total of nine multiple-choice items. Two brief documents were also included (information material, tables) with nine multiple-choice items. The maximum score on the reading comprehension test was then 18 points. However, we also kept the two kinds of tasks (prose reading, document reading) separately. To some extent these two types of material might require partly different kinds of information processes. We will return to this issue in the results section.

Vocabulary. The vocabulary test included 40 items (Johansson, 1992). For each word presented the task was to select among five alternatives the best fitting synonym to the target word. In cases of poor reading skill the target and the alternatives were also read aloud to the pupil. The vocabulary test had standardized norms for the relevant age groups.

Word decoding

Since word decoding is a key function in reading and a skill typically poorly developed among pupils with dyslexia it was particularly important to have a valid and reliable assessment of this function. By using multiple indicators we have attempted to achieve a satisfactory estimate of word decoding skills.

Wordchains. Written words were presented in chains of three words without space between successive words. The task was simply to mark with a pencil where the divisions should be (e.g. girl/chair/meet). A large number of such chains were presented, and the performance was expressed as the number of correctly divided chains within a period of three minutes. High scores on this task require fast and accurate word recognition on the orthographic stage of reading development (Høien & Lundberg, 1989). Norms based on large and representative groups in the relevant ages were available (Jacobson, 1999). The Wordchains test has proven to be highly correlated with conventional word reading tests and many other more complex measures of reading ability. The test–retest reliability is also very high (0.92) (Jacobson, 1995; Miller Guron, 1999).

Oral word reading. A list of 25 words was presented and the task was simply to read the words in the list aloud as fast and as accurately as possible. The total time and the number of errors were recorded. Standardized norms were available (Jacobson & Svensson, unpublished).

Oral sentence reading. Oral reading of connected text gives an indication of how accurate and how well automatized the word decoding is. A brief narrative text was presented (59 words) and the task was simply to read the text aloud as fast and as accurately as possible. The total time and the number of reading errors were recorded. Norms for the different age groups were available (Jacobson & Svensson, unpublished).

Spelling. Although the present study is not focused on writing we have used a spelling task as an indication of the precision of the mental representations of orthographic patterns. A conventional dictation test with 36 words was used (Björkquist & Järpsten, 1983). Each word was first presented in a sentence context to clarify the meaning of the word. The word was then repeated in isolation and the pupil was asked to write the word. The score was the total number of correctly spelled words. Only norms for the younger age groups were available.

Orthographic choice. Fast word recognition includes the ability to take advantage of frequent spelling patterns or orthography of words based on a precise mental or internal lexical representation. An orthographic choice task was used modeled after Olson, Forsberg, Wise and Rack (1994). A real word was presented together with a pseudo-homophone of the same word (e.g. cykel, sykkel) and the task was to decide which of the two alternatives was the correct word. Since both alternatives sound the same when pronounced,

the decision must be based on knowledge of the correct spelling. A total of 130 such pairs was presented, and the number of correctly chosen words over a working period of two minutes was used as performance score. Norms for the different age groups were available (Olofsson, 1995).

Phonological functions

According to our framework poor word reading (decoding) is in most cases related to poor phonological functions. As we have noted, the prevailing consensus view among dyslexia researchers is that phonological dysfunction is a core symptom or a marker of developmental dyslexia. The present study includes an attempt to determine the prevalence and nature of dyslexic problems among our inmates. It was thus important to have valid and reliable indicators of phonological functions. Tasks involving pseudo-word reading indicate the ability to translate graphemes into phonemes. Thus, a letter-identification component is involved. However, the main obstacle for failing on such tasks is supposed to be related to phonological problems. (Hatcher, Snowling & Griffiths, 2002; Rack, Snowling & Olson, 1992).

Pseudo-word reading. A list of 25 pseudo-words was presented. The words varied in length from two to four syllables. Some words were rather similar to real words whereas others looked stranger. However, all words were pronounceable. The task was simply to read the words aloud as fast and as accurately as possible. The total time needed to read the list and the numbers of words read correctly were recorded. Norms for the different ages were available (Jacobson & Svensson, unpublished).

Pseudo-text reading. In a brief narrative text close to one third of the words were changed into pseudo-words with inflectional morphemes preserved making the syntactic frame of the text rather natural. The task was to read the passage aloud as fast and as accurately as possible. Total reading time and errors were recorded. This test format was successfully used by Gross-Glenn (1990) in an attempt to diagnose dyslexia among adult readers.

Phonological choice. This task was modeled after Olson et al. (1994) as an indicator of phonological processing capacity in reading. Pairs of pseudo-words were presented. One word in the pair sounded like a real word when it was sounded out, whereas the other word had no word-likeness. The task was to decide which of the two words in a pair sounded like a real word. Pages with 20 word pairs on each were presented. The total working time was two minutes. The performance was expressed as the number of correctly

marked pseudo-words. Swedish norms were available (Olofsson, 1995). Successful performance on this task required fast and precise phonological recoding as well as rapid access to the mental lexicon.

Digit span. A well functioning phonological module is also indicated by efficient short-term memory for verbal material. The digit span sub-test of WISC-III (1992) was selected. Success on this test does not only require good phonological encoding and an efficient phonological loop but also sustained attention and concentration.

Word generation. The final task in the phonological assessment category tested the ability to use a phonological criterion for producing words. The task was modeled after Frith, Landerl and Frith (1995). The subject was requested to generate as many words as possible according to a phonological criterion – in this case words beginning with a specified sound (s- or t-words). The time taken to generate 10 words was recorded. As a control condition a similar word generation task was used but based on a semantic criterion (animals or edible things). Thus a total of 4 generation tasks were performed (s-words, t-words, animals, edible things). These tasks were given in counterbalanced order to control for possible progressive effects. A dissociation of the results was expected: dyslexic individuals would not significantly differ from other pupils on the semantic tasks. The phonological tasks, however, were supposed to be more difficult for pupils with dyslexia.

Cognitive and intellectual functioning

Although general cognitive functions and some other individually related factors such as temperament were specified in our framework, we did not explicitly include these functions in our assessment battery. Most juvenile inmates had been rather thoroughly assessed in these respects as part of the general diagnostic program used at the penal institutions. We had access to all earlier test results and used them when they could supplement our interpretation of individual results. All juvenile inmates in the study had IQ-scores within the normal range. Those below 80 (2 individuals) were excluded from the study.

However, one aspect of general cognitive functioning was tested. Already since the days of Galton, mental speed has been considered a relevant aspect of cognitive functions. Choice reaction time has also been regarded as an indicator of underlying efficiency of temporal processing (Nicolson & Fawcett, 1994). Stringer and Stanovich (2000) have demonstrated that choice reaction time shared variance with general cognitive ability and phonological awareness. The task used in this study to assess choice reaction time was

equivalent to the Wordchains task. Instead of words, however, a string of letters was presented (Letterchains test, Jacobson, 1995), and the task was to mark a pencil line between the two adjacent letters that were the same. Two such pairs in each letter chain occurred, e.g. CFTTRGKKNB, where the marks should be as follows: CFT/TRGK/KNB. The performance was expressed as the number of correctly marked chains within a period of 1.5 minutes.

Self-esteem questionnaire. A Swedish instrument developed and standardized by Ouvinen-Birgerstam (1985) was used. It included 72 statements related to self-esteem with four alternatives for each statement on a scale from "strongly agree" to "totally disagree". The response pattern could be represented as standardized scores on the following five dimensions: "Physical appearance and quality", "skills and talents", "psychological well-being", "relation to parents and family", and "relation to others".

Interview. The interview primarily concerned reading habits, reading interests, and reading involvement. Self-concept related to literacy skills was also explored. Some of the questions concerned literacy resources and cultural capital at home, such as number of books, access to daily newspapers, values related to reading, early literacy stimulation etc. Questions concerning school life occupied a part of the interview, for example success or failure in school, school attendance, truancy, friends in school, bullying, and relation to teachers. Future aspirations and goals concerning education, work and family life were also discussed during the interview.

Archive material. With special permission from the director of each juvenile institution, we had access to personal files and archived data from earlier assessments of each pupil. This material provided an opportunity to validate the interviews and get more detailed information concerning background conditions in home and school. Diagnoses from earlier psychological examinations were also available.

Results

Table 2 presents the mean scores, standard deviations and norms on the different tests. The juvenile inmates have been divided into three age groups. Norm means are given for each age group.

The first section of Table 2 demonstrates that the inmates at the institutions had significantly lower scores on reading comprehension than the norm mean based on a representative sample of Swedish 14-year-olds. Obviously,

Table 2. Results from all juvenile inmates divided into three age groups with age specific norms.

	13–14 years (n = 17)			15–16 years (n = 32)			17–21 years (n = 21)		
	M	SD	Norm	M	SD	Norm	M	SD	Norm
Reading comprehension									
Connected text	7.2	2	8.2	7.3	2.1	8.2	7.7	1.8	8.2
Information text	7.7	1	8.2	7.6	1.5	8.2	7.9	1.5	8.2
Total	14.8	2.5	16.4*	14.9	3.2	16.4*	15.2	2.6	16.4*
Vocabulary									
Vocabulary	18.5	6.1	21.3	20.2	8.2	24.8**	21.6	6.9	29.8**
Word decoding									
Wordchains	51.1	15.1	60*	62.3	17.5	63.3	61.7	10.5	71**
Word reading time	21.7	15.7	22.1	**15.2**	4.3	18.6**	16.3	5.1	16.8
Word reading error	0.6	1	0.9	0.5	1.3	0.6	0.3	0.5	0.1
Spelling[a]	27.6	6.3	29.5	31.2	7.1	29.5	**32.1**	3.1	29.5**
Orthographic choice	57.3	24.3	77.6**	77.9	24	87.2*	74	15.1	90.8**
The reading of running text									
Text reading time	26.3	13.4	26.3	20.6	6.2	20.2	20.6	5.7	21.1
Text reading error	0.8	1	0.5	0.4	0.7	0.7*	0.2	0.4	0.2
Phonological ability									
Pseudo-word time	37.9	16.6	38.7	**27.6**	9.3	33.2**	30.9	13	30.2
Pseudo-word error	1.8	1.5	2.5	**1.8**	2.2	3.2**	**1**	1.1	1.35
Pseudo-text time	50.9	21.3	51.7	**38.4**	11.1	45.4**	42.8	14.5	41.7
Pseudo-text error	3.7	2.5	3.7	3.6	3.1	4.5	2.8	1.9	2.3
Phonological choice	34.5	12	32.8	39	10.1	35.4	38.7	10.1	35.4
Word generation phonology[b]	55.2	29		32.7	19.9		33.5	17.3	
Digit span	12.8	3	15*	13.7	3.7	15.6**	15.2	2.2	15.6
Word generation semantic[b]	23.9	11		18.3	8.3		17.5	7.5	
Perceptual motor speed									
Letterchains	37.5	7.8	40.3	38.8	8.5	41.5	38.2	6	46.5**
Self-esteem (Stanine)									
Physical quality	4.5	1.9	5	5.3	2	5	4.5	1.9	5
Skills and talent	5.5	2.4	5	5.4	2.1	5	4.8	1.7	5
Psychological well-being	3.3	1.3	5**	3.3	1.9	5**	2.9	1.7	5**
Relation to parents	4.4	2.1	5	3.9	2.3	5*	3	1.6	5**
Relation to others	4.4	1.7	5	5	2	5	4.6	2.1	5

*$P < 0.05$, **$P < 0.01$. Significant differences to the norm value.
[a]Age 12 norms.
[b]No norms available.
Values significantly better than norm are marked in bold type.
One of the juvenile inmates with serious reading and writing disabilities is not included in the results on technical reading (word decoding, phonological ability, reading of connected texts). This pupil had such serious difficulties that he was regarded as an extreme outlier.

there are literacy problems among our juvenile inmates. Unsurprisingly, their vocabulary scores were also below the norm means, especially in the older age group.

Some of the word decoding measures, however, did not indicate particular problems. The time measure as well as the accuracy measure actually indicated a slightly better performance among our inmates as compared to the norm groups. On the other hand, our inmates scored significantly lower on the Wordchains test and the orthographic choice task.

On average, the phonological measures did not indicate any particular problems among our juvenile inmates. On the contrary, the 15–16-year-olds even significantly outperformed the norm group on the pseudo-word and pseudo-text tasks. The digit span task was probably not a very pure phonological task for our group of inmates. Lack of attention or poor concentration probably contributed to their comparatively low performance.

On two of the five dimensions of self-esteem, psychological well-being and relation to parents, our juvenile inmates had lower scores than the norm groups. They seemed to accept their physical qualities and they were reasonably well satisfied with their skills and talents and reported good relations to others. The main dependent variable in the framework was reading comprehension. The first natural question to ask, then, is to what extent reading comprehension can be explained by the factors specified in the framework. Stepwise multiple regression analysis demonstrated that only two variables had unique explanatory power. Vocabulary and spelling together explained 33% of the variance in reading comprehension. Vocabulary alone explained 25%. All other variables were excluded from the analysis since they gave no unique contributions.

Gender differences on literacy tasks have often been observed (Wagemaker, 1996). This has also been the case among inmates in juvenile institutions (Svensson et al., 2001). As can be seen in Table 3, the detailed reading-related assessments in the present study confirmed and extended earlier findings.

Table 3 shows that the girls outperformed the boys on 18 out of 20 measures. On two measures, document reading and phonological choice, the scores were similar.

In our earlier study (Svensson et al., 2001) we observed an interesting difference between native Swedes and immigrants. The groups did not differ very much on word recognition and spelling, but immigrants were clearly poorer in comprehending connected text. In the present study we could confirm this finding. Our results permitted us to form carefully matched pairs of juvenile inmates with one native Swede and one immigrant in each pair. The inmates in each pair had exactly the same scores on word decoding and

Table 3. Results for 48 boys and 21 girls on all variables.

	Boys		Girls	
	M	SD	M	SD
Reading comprehension				
Connected text	7.5	1.8	7.6	1.9
Information text	7.6	1.7	7.6	1.5
Total	14.9	2.9	15.1	2.8
Vocabulary				
Vocabulary	20.1	7.3	20.3	7.6
Word decoding				
Wordchains	57.1	16.3	64.6	12.7
Word reading time	17.7	10.2	15.8	5.5
Word reading error	0.6	1.2	0.2	0.4
Spelling[a]	29.7	6.3	32.5	5.5
Orthographic choice	69.9	23.4	75.7	22.4
Reading of continuous text				
Text reading time	22.7	9.8	20.4	5.2
Text reading error	0.5	0.8	0.3	0.6
Phonological ability				
Pseudo-word time	31.9	13	29.3	13.3
Pseudo-word error	1.7	1.9	1.2	1.5
Pseudo-text time	44.6	16.5	38.7	13.4
Pseudo-text error	3.6	2.7	3	2.5
Phonological choice	37.8	11.3	37.7	8.8
Word generation phonology	42	24.7	31.6	9.4
Digits span	13.4	3.4	14.9	2.7
Word generation semantic	20.1	8.7	17.8	7
Perceptual motor speed				
Letter chain	37.2	7.5	40.9	7.2
Self-esteem (Stanine)				
Physical quality	4.8	1.9	4.7	2.3
Skills and talent	5.2	2	5.3	2.2
Psychological well-being	3.3	1.7	2.9	1.7
Relation to parents	4.2*	2.2	2.8	1.7
Relation to others	4.8	2.2	4.6	1.4

*$P < 0.05$.
[a]Age 12 norms.

Table 4. Reading comprehension of 11 native Swedes and 11 immigrants matched on word decoding and spelling.

	Swedes		Immigrants		
	M	SD	M	SD	*t*(df)
Prose	8.5	0.9	7.3	1.3	−2.48 (20)*
Documents	7.5	1.5	7.9	1.5	0.60 (20)
Total	15.8	2	15.2	2.2	−0.71 (20)

*$P < 0.05$.

spelling. A total of 11 such pairs could be established. Table 4 presents the results.

The scores on document reading were about the same for the two groups, whereas the immigrants had significantly lower performance on connected prose. Obviously, some process over and above technical reading skill is required for connected texts. Prior knowledge and relevant interpretation schemas are probably good candidates as explanations of the observed difference.

Subgroups differing in phonological skills

A core factor in the dyslexia syndrome is related to phonological functions. To demonstrate the critical importance of this factor we compared a group of juvenile inmates with remarkably low phonological skills with another subgroup characterized by above normal phonological function.

The group with low phonological skills included inmates with scores lower than 0.5 standard deviation units below the means on pseudo-word and pseudo-text reading (a combined *z*-score based on accuracy and time). The other inclusion criterion was that they scored below the mean for normal pupils in grade 7 (13-year-olds) on the phonological choice task and/or on the digit span task.

The group with high phonological skills included inmates with scores higher than 1 standard deviation above the mean on pseudo-word and pseudo-text reading, above the norm mean for 15-year-olds on phonological choice and/or digit span.

With these criteria the poor phonology group consisted of 11 juvenile inmates (8 boys and 3 girls). Five of them had an immigrant background. The group with high phonological ability had 9 inmates (6 boys and 3 girls), 2 with an immigrant background. The extreme groups did not differ in terms of

age (15.3 for both groups). In the low phonology group, two immigrants had arrived in Sweden before school started and in the high phonology group, both immigrants had arrived in Sweden before the start of school. Table 5 presents the results for the two groups.

It is expected that poor phonological ability is strongly associated with poor word reading skill. This prediction came out on all measures of word reading. On the average, the group with high phonological ability read the word list almost three times as fast as the low group. The text reading was performed 2.5 times as fast by juvenile inmates with high phonology. Spelling and orthographic choice were also considerably poorer among inmates with poor phonology. Furthermore, the poor phonology group was also poorer in word-generation on phonological tasks in contrast to semantic tasks where the groups were similar.

The group differences in reading comprehension seemed less dramatic. However, the poor phonology readers did not reach more than 13.4 correct responses out of 18 as compared to readers with high phonological ability that scored 15.9 points. The vocabulary difference between the extreme groups was more remarkable. The low phonology group only reached half as many points as the high phonology group (11.7 vs. 22.6).

The self-esteem scale indicated higher scores for the low phonology group on "psychological well-being" and "relation to others" which might seem paradoxical. It might be the case that poor reading among the institutionalized young people has less personal significance than it might have for other adolescents. There are probably more powerful determinants of self-esteem and social adjustment among juvenile delinquents than success in a field that has been poorly valued over a long period of time.

Is the poor phonology group equivalent to a dyslexia group? With reference to the consensus view of dyslexia as a phonological disturbance causing direct problems with word decoding and indirect problems with reading comprehension, it seems as if we are dealing with rather clear cases of dyslexia. However, we should note that 3 of the 11 juvenile inmates in the poor phonology group have not lived in Sweden for a very long time. One girl has been here for only three years and still has considerable difficulties with Swedish. Two boys have been here for 5 or 6 years, which should be sufficient in many cases. On the other hand, these boys have had a very irregular school time with extensive truancy. We cannot exclude the possibility that part of their phonological problems is linguistic or educational rather than constitutional in nature and origin. Their limited experience with Swedish at home might also, to some extent, have contributed to their poor performance on phonological tasks in Swedish (for further discussion, see Miller Guron and

Table 5. Results of all measures for a group with poor phonological skill ($n = 11$) and a group with high phonological skill ($n = 9$).

	Poor phonology		High phonology	
	M	SD	M	SD
Reading comprehension				
Connected text	6.9	1.7	7.7	1.4
Information text	6.5	1.5	8.2*	1.2
Total	13.4	2.9	15.9	2.1
Vocabulary				
Vocabulary	11.7	6.4	22.6*	8.1
Word decoding				
Wordchains	51.4	11.7	72.4**	11.4
Word reading time	29.7	17.9	11.3**	1.5
Word reading error	1.9	2.1	0*	0
Spelling	26.1	5.4	34.9**	1.5
Orthographic choice	48.2	22.4	94.5**	10.9
Reading of continuous text				
Text reading time	37.2	11.7	14.8**	2.3
Text reading error	1.4	1	0**	0
Phonological ability				
Pseudo-word time	53.1	19.2	19.2**	4.5
Pseudo-word error	3.7	2.7	0.9**	1
Pseudo-text time	68.9	19.4	27.2**	4.7
Pseudo text error	6.8	3.7	1.9**	0.9
Phonological choice	25.5	7.9	45.3**	7.7
Word generation phonology	43.8	24.2	33.6	23.3
Digit span	11.5	3.3	14.9	3.3
Word generation semantic	19	7.8	19.7	14
Perceptual motor speed				
Letterchains	37.4	8.7	42.7	6.5
Self-esteem (Stanine)				
Physical quality	5.4	1.8	5.4	2.3
Skills and talent	4.9	1.4	5.5	2.4
Psychological well-being	4.4	2.1	2.9	1.2
Relation to parents	3.5	2.7	2.6	1.8
Relation to others	5.6	2.1	4.8	1.2

*$P < 0.05$, **$P < 0.01$.

Lundberg, 2003). Thus, there are reasons not to include these three inmates in a pure dyslexia category. That leaves us with a total of 8 students out of 70, or 11% who fulfill rather strict criteria for being dyslexic in the sense currently used. This figure comes close to the estimate we presented in our earlier study (Svensson et al., 2001).

The interviews and the personal files provided rich additional information concerning the frame factors specified earlier. Does the group with poor phonology differ from the other groups in terms of cultural conditions, schooling, and home conditions? Most of the background problems appear to be fairly equally distributed across the groups. A majority of the inmates, regardless of phonology group, had experiences of early and many separations and neglect during childhood, an absent father, drug abuse in the home, limited access to adult literacy models, no informal socialization, irregular schooling with frequent changes of teachers, high absenteeism, conduct disorders, and attention problems. The whole spectrum of risk factors for antisocial behavior could be identified among the juvenile inmates regardless of phonological skill. However, a few subtle differences could be discerned. For the inmates with low phonological ability the following observations were made:

- Parents had, on average, lower education and less well paid employment.
- Parents were more often immigrants and had lived in Sweden for a shorter period of time.
- They had, on average, fewer books at home.
- Mothers tended to be the only person who read aloud to the children, whereas both parents were more often mentioned among inmates with good phonological ability.
- Special education in school had been provided to many juvenile inmates in both groups. Poor achievement was the more frequent reason among inmates with poor phonological ability, whereas conduct problems were a more frequent reason among inmates with good phonological ability.
- They had more documented early reading and writing problems.
- They reported more often that they preferred to listen before reading.
- They had lower average marks in school than inmates with good phonological ability.

All of these tendencies were small with many exceptions. The general pattern, however, was that juvenile inmates with poor phonological ability had a history of early reading problems, which has had an expected impact on their school experience and their attitudes towards reading.

Table 6. Results for 61 reading-level-matched controls and 61 juvenile inmates on a word-reading test and two tests of phonological ability. The average age for the juvenile inmates was 16.8 and for the controls 13.3.

	Juvenile inmates		Reading-level-matched group		
	M	SD	M	SD	*t*(df)
Wordchains	57.2	14.5	57.7	14.6	−0.006 (120)
Phonological choice	30.6	9.0	26.9	7.7	2.475 (120)*
Pseudo-word reading	31.4	13.4	35.0	11.6	−1.581 (120)

*$P < 0.05$.

Table 7. Results for 40 inmates and 40 age-matched students on a word reading test and two tests of phonological ability. The average age was 15.3 for both groups.

	Juvenile inmates		Comparison participants		
	M	SD	M	SD	*t*(df)
Wordchains	59.1	18.0	66.9	14.0	−2.181 (78)*
Phonological choice	30.6	9.1	30.2	8.70	0.165 (78)
Pseudo-word reading time	31.3	13.4	29.4	9.40	0.714 (78)

*$P < 0.05$.

Reading-level and age matched controls

To further emphasize the importance of phonological functions in dyslexia, we compared the inmates with a reading-level-matched (based on decoding skill) and an age-matched comparison group with respect to phonological functions. Table 6 presents the results for 61 reading-level-matched controls and 61 juvenile inmates of a one-word reading test and two tests of phonological ability.

Table 6 shows that juvenile inmates almost have the same mean as the reading-level-matched comparison group in a word-reading test. Furthermore, there was a significant difference between the groups with respect to phonological choice, where the inmates outperformed the controls.

Table 7 presents the results for 40 age-matched comparison students and 40 inmates of a word-reading test and two tests of phonological ability.

There were no significant differences between the groups with respect to two tests of phonological ability. However, the comparison group outperformed the inmates on the decoding test.

Discussion

The aim of the present study was to clarify the nature of reading problems observed among inmates in juvenile institutions. A more specific purpose was to attempt to identify the juvenile inmates with dyslexic problems as reflected in poor phonological ability. In the theoretical framework guiding the study a number of proximal as well as more distal factors related to reading achievement were specified. With regard to the richness of potential obstacles for adequate reading achievement, we did not expect the more restricted or circumscribed dyslexic weakness to be the most common cause of reading disabilities among the juvenile delinquents.

Although a considerable proportion (almost 50%) of the juvenile inmates had some kind of reading difficulty, the results of the extensive assessment program indicated that only about 10% of the inmates showed such pronounced phonological difficulties that they met the dyslexic criterion. This incidence is far less than reported in earlier studies of similar populations (Alm & Andersson, 1997; Jensen, Lindgren, Meurling, Ingvar & Levander, 1999; Kirk & Reid, 2001; Moody et al., 2000). However, most earlier studies focused on manifest reading problems without making a distinction between decoding and comprehension. Furthermore, an IQ-discrepancy criterion has been applied. Our model indicates that manifest reading problems may have a multitude of possible causes (see also Malmgren, Abott & Hawkins, 1999; Rice, 2001). Most often we have to consider a complex network of interrelated proximal and distal factors. Thus, dyslexia in the sense of a restricted weakness in the phonological module does not seem to characterize inmates in juvenile institutions more than pupils in general. This statement was strengthened by the fact that there were no differences in phonological skills between the reading-level-matched comparison group and the inmates. Nor was there any difference between the age-matched comparison group and the inmates in terms of phonological ability despite the fact that the comparison group outperformed the inmates in a word-reading test. The findings in the current study confirm those of earlier studies concerning the link between reading and writing difficulties and criminality (Fergusson & Lynskey, 1997; Rice, 2001; Samuelsson et al., 2003).

It seems as if the poor reading observed is primarily related to limited opportunities to learn and to more general cognitive problems. Many juvenile inmates with reading problems had already, before the onset of compulsory schooling, lived under sub-optimal conditions characterized by factors such as parental neglect, difficulties with early attachment, lack of emotional and cognitive support, poor linguistic stimulation, cultural deprivation, irregular living, or the whole spectrum of classical risk factors for later conduct problems. In addition, they encountered unfavorable conditions in school with

several changes of teachers, sometimes during critical periods of reading acquisition, periods of absenteeism and truancy. Later conduct problems led to exclusion from ordinary instruction, which further decreased the time on task and certainly prevented efficient skill learning. This pattern of difficulties and unfavorable conditions for development and learning seemed to characterize most of the juvenile inmates participating in this study regardless of their phonological problems.

The most pronounced reading problems, both in terms of comprehension and word decoding were observed among the older pupils. This might simply reflect the limited sample of juvenile inmates assessed in the present study. However, it is possible that the older inmates have more serious problems. Younger inmates with reasonable potential for developing their reading skills and who reach an adequate literacy level might have better chances to find a life style that keeps them out of institutions. If this is the case we have strengthened arguments for the strategic value of effective reading instruction in the treatment of inmates in juvenile institutions.

Immigrant inmates are clearly over-represented in juvenile institutions. Although many of them have been in Sweden for a considerable part of their lives (some are even born in Sweden), they most often speak a language at home that is very different from Swedish. A majority of these inmates learn to identify written words with the same speed and accuracy as native Swedes. However, their comprehension of connected texts is often much lower. Their problems with reading comprehension probably reflect many factors, such as less developed reading habits, lack of print exposure and early informal literacy socialization, problems with the deeper semantic and syntactic dimensions of language and a more limited vocabulary. The scores on the vocabulary test were particularly low for the immigrant juvenile inmates.

In an attempt to find out the impact of various factors related to reading comprehension, a multiple regression analysis was performed. This showed that only two factors significantly contributed to explaining the variance in reading comprehension. Vocabulary and spelling together explained one third of the variance, with vocabulary alone explaining as much as one fourth. No other variable gave any significant contribution. It then seems reasonable to assume that the poor reading comprehension observed among the immigrant inmates can to a considerable degree, be explained by their limited vocabulary. If the reader does not know many of the words in a text he/she cannot expect much understanding of the text.

Also the group with pronounced phonological problems had very low scores on the vocabulary test and the reading comprehension test. Here the limited vocabulary might be more directly linked to the poor phonological

ability. According to Baddeley, Gathercole and Papagno (1998), vocabulary acquisition is closely related to the efficiency of the phonological loop. When new words are encountered they have to be encoded efficiently to be established in long-term memory. Poor phonological functioning is then clearly a disadvantage, which can only be overcome by frequently repeated and concentrated meetings with the new words. The unfavorable early conditions for language development among the institutionalized inmates have certainly not promoted the development of a rich vocabulary (see Hart & Risley, 1995) or helped the juvenile inmates with poor phonological ability to overcome their vocabulary problems.

An increased vocabulary is certainly a necessary but far from sufficient condition for impaired reading comprehension. As indicated in our framework, successful processing of text requires a motivational driving force, a personal involvement, readiness to "go into" the text world and identify oneself with protagonists. The reader must have the courage to feel that he/she has something to contribute to the creation of meaning. The questionnaire on self-esteem together with data from interviews and records, however, yielded a rather gloomy picture. Histories of repeated cognitive and social failures, poor scores on the scale of psychological well-being, emotional turmoil and such have raised severe obstacles for developing the motivational power necessary for successful reading comprehension. Repeated failure in comprehending a text inevitably leads to avoidance behavior. Limited reading experience prevents the pupils from skill acquisition, which, in turn, makes reading an over-demanding task. The pedagogical challenge for the juvenile institutions, then, is to break this vicious circle and find ways to open the exciting world of literature for the youngsters and give them access to valuable emotional and moral experiences through literature. Reading is far more than a technical skill; it is a critical part of the socialization of young people.

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References

Alm, J. & Andersson, J. (1997). A study of literacy in prisons in Uppsala. *Dyslexia 3*, 245–246.

Baddeley, A., Gathercole, S. & Papagno, C. (1998). The phonological loop as a language learning device. *Psychological Review 105*, 58–73.

Björkquist, L.M. & Järpsten, B. (1983). *DLSM*. Diagnostiska Läs- och skrivmaterial för mellanstadiet. Handledning del 1. Administrering och utvärdering. [*Diagnostic reading and writing test for ten- to twelve-year-olds*.] Stockholm: Psykologiförlaget.

Crawford, D. (1996). Review of research on learning disabilities and juvenile delinquency. In S.C. Cramer & W. Ellis (eds.), *Learning disabilities: Lifelong issues* (pp. 203–209). Baltimore: Brookes.

Dalteg, A., Rasmussen, K., Jensen, J., Persson, B., Lindgren, M., Lundqvist, A., Wirsén-Meurling, Ingvar, D.H. & Levander, S. (1997). Prisoners use an inflexible strategy in a continuous performance test: A replication. *Personality and Individual Differences 23*, 1–7.

Elley, W.B. (ed.) (1994). *The IEA study of reading literacy: Achievement and instruction in thirty-two school systems*. Oxford: Pergamon.

Fergusson, D.M. & Lynskey, M.T. (1997). Early reading difficulties and later conduct problems. *Journal of Child Psychology and Psychiatry 8*, 899–907.

Frith, U., Landerl, K. & Frith, C. (1995). Dyslexia and verbal fluency: More evidence for a phonological deficit. *Dyslexia 1*, 2–11.

Frith, U. (1999). Paradoxes in the definition of dyslexia. *Dyslexia 5*, 192–214.

Gross-Glenn, K. (1990). Nonsense passage reading as a diagnostic aid in the study of adult familial dyslexia. *Reading and Writing: An Interdisciplinary Journal 2*, 161–173.

Hart, B. & Risley, T.R. (1995). *Meaningful differences in the everyday experience of young American children*. Baltimore, Maryland: Brookes.

Hatcher, J., Snowling, M.J. & Giffiths, Y.M. (2002). Cognitive assessment of dyslexic students in higher education. *British Journal of Higher Education, 72*, 119–133.

Høien, T. & Lundberg, I. (1989). Stages of word recognition in early reading acquisition. *Scandinavian Journal of Educational Research 3*, 163–182.

Høien, T. & Lundberg, I. (2000). *Dyslexia: from theory to intervention*. Dordrecht, The Netherlands: Kluwer Academic Publishers.

Jacobson, C. (1995). Hur utvecklas läsförmågan? Resultat från Ordkedjetestet. [How does reading ability develop? Results of the Wordchains test.] In C. Jacobson & I. Lundberg (eds.), *Reading Development and Dyslexia* (pp. 196–204). Stockholm: Liber utbildning.

Jacobson, C. (1999). How persistent is reading disability? Individual growth curves in reading. *Dyslexia 5*, 78–93.

Jensen, J., Lindgren, M., Meurling, A.W., Ingvar, D.H. & Levander, S. (1999). Dyslexia among Swedish inmates in relation to neuropsychology and personality. *Journal of the International Neuropsychological Society 5*, 452–461.

Johansson, M.G. (1992). *Klassdiagnoser i Läsning och Skrivning för högstadiet och gymnasiet*. [*Group diagnosis in reading and writing for middle school and sixth-form pupils*.] Handledning. Stockholm: Psykologiförlaget.

Kirk, J. & Reid, G. (2001). An examination of the relationship between dyslexia and offending in young people and the implications for the training system. *Dyslexia 7*, 77–84.

Lundberg, I. (1999). Towards a sharper definition of dyslexia. In I. Lundberg, F.E. Tønnesson & I. Austad, (eds.), *Dyslexia: Advances in theory and practice* (pp. 9–29). Dordrecht, The Netherlands: Kluwer Academic Publishers.

Malmgren, K., Abbott, R.D. & Hawkins, J.D. (1999). LD and delinquency: Rethinking the link. *Journal of Learning Disabilities 32*, 194–200.

Miller Guron, L. (1999). *Wordchains: A word reading test for all ages*. Windsor: NFER-Nelson.

Miller Guron, L. & Lundberg, I. (2003). Identifying dyslexia in multilingual students: Can phonological awareness be identified through the majority language? *Journal of Research in Reading*.

Moody, K.C., Holzer, C.E., Roman, M.J., Paulsen, K.A., Freeman, D.H., Haynes, M. & James, T.N. (2000). Prevalence of dyslexia among Texas prison inmates. *Texas Medicine 6*, 69–75.

Newman, A., Lewis W. & Beverstock, C. (1994). *Prison literacy: Implications for program and assessment*. Connections. National center on adult literacy, University of Pennsylvania.

Nicolson, R. & Fawcett, A. (1994). Comparison of deficits in cognitive and motor skills among children with dyslexia. *Annals of Dyslexia 44*, 147–164.

Olofsson, Å. (1994). *Ordavkodning: Mätning av fonologisk och ortografisk ordavkodningsförmåga*. [*Word decoding, phonological and orthographic decoding ability*.] Östersund: Läspedagogiskt Centrum.

Olson, R.K., Forsberg, H., Wise, B. & Rack, J. (1994). Measurement of word recognition, orthographic and phonological skills. In G. Lyon (ed.), *Frames of reference for the assessment of learning disabilities: New views on measurement issues* (pp. 243–277). Baltimore, Maryland: Paul H. Brookes.

Ouvinen-Birgerstam, P. (1985). *Jag tycker jag är. Manual*. [*Manual to "This is how I am"*.] Stockholm: Psykologiförlaget AB.

Rack, J.P., Snowling, M.J. & Olson R.K. (1992). The non-word reading deficit in developmental dyslexia: A review. *Reading Research Quarterly 27*, 29–53.

Rice, M. (2001). *Dyslexia and crime, or an elephant in the moon*. Paper presented at the 5th BDA International Conference: At the dawn of the new century, York.

Samuelsson, S., Gustafson, S., Herkner, B. & Lundberg, I. (2000). Is the frequency of dyslexic problems among prison inmates higher then in a normal population? *Reading and Writing: An Interdisciplinary Journal 13*, 297–312.

Samuelsson, S., Herkner, B. & Lundberg, I. (2003). Reading and writing difficulties among prison inmates: A matter of experiential factors rather than dyslexia. *Scientific Studies of Reading*.

Sarnecki, J. (1991). *Ungdomarna på institutionerna. Uppföljning av §12-vården.* [*Youth in penal institutions. A follow-up of paragraph 12 care*.] Stockholms läns landsting. Delrapport 2.

Snowling, M.J. (2000). *Dyslexia*, 2nd edn. Oxford: Blackwell.

Snowling, M.J., Adams, J.W., Bowyer-Crane, C. & Tobin, V. (2000). Levels of literacy among juvenile offenders: The incidence of specific reading difficulties. *Criminal Behaviour and Mental Health 10*, 229–241.

Stringer, R. & Stanovich, K.E. (2000). The connection between reaction time and variation in reading ability: Unravelling covariance relationships with cognitive ability and phonological sensitivity. *Scientific Studies of Reading 1*, 41–53.

Svensson, I., Lundberg, I. & Jacobson, C. (2001). The prevalence of reading and spelling difficulties among inmates of institutions for compulsory care of juvenile delinquents. *Dyslexia 2*, 62–76.

Wagemaker, H. (ed.) (1996). *Are girls better readers? Gender differences in reading literacy in 32 countries*. Delft, The Netherlands: IEA Eburon Publishers.

Wechsler, D. (1992). *WISC-III. The Wechsler Intelligence Scale for Children – Third Edition*. Kent, UK: The Psychological Corporation.

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