DIFFERENT PATTERNS OF READING PERFORMANCE: A LATENT PROFILE ANALYSIS

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Abstract

The objective of the current investigation is to replicate the results of a previous study on subgrouping of poor readers. One important aim of the study to be replicated was to develop tools, not only for identifying poor readers, which is a rather straightforward task, but also for examining the pattern of poor reading based on a theoretical analysis of the reading process. Eight distinct subgroups of reading performance were identified. The statistical method used was *Latent Profile Analysis*. The literacy tasks were composed of three kinds of reading material: narrative prose, expository prose and documents, and the major emphasis was placed on comprehension. Low performance of reading comprehension can for some students be due to slow or inaccurate word decoding. Therefore, a speeded word recognition test was added to the battery. Background variables, such as economic and cultural factors were also examined in the different subgroups. The profiles were based on ten variables. The main aspects for the profile interpretation were word recognition, reading speed, comprehension of connected prose and interpretation of brief documents. The present study examines whether the subgroups among poor readers are stable over different samples. Participants in both samples were 9-year-old students from the Swedish part of the IEA 10-Year-Trend Study (the previous study from 2001 and the current study from 1991). Around 5000 students participated each time. The current study is not finalized. However, there are some indications that corresponding subgroups are identifiable.

INTRODUCTION

A common view on reading is that it is a cultural skill developed within a specific cultural and historical context. A corollary of this view is that reading can be seen as a cultural relative phenomenon.

In a study by Peterson (as cited in Gough 1995) 135 naval reservists were assessed on reading comprehension, listening comprehension and word decoding in two domains, baseball and computers. The reservists' background knowledge of the two subjects was also measured. In both listening and reading comprehension the correlation across the domains was rather low, i.e., the comprehension was relative to the domain. The correlation of word decoding, on the other hand, was very high across the domains, and appeared to be independent of the reader's background knowledge. Peterson's conclusion from the study was that reading comprises two skills, comprehension and decoding.

In Peterson's study the domains were very specific with high demands on certain, very different, knowledge structures for both reading and listening comprehension. It is not surprising that someone who, for example, is very knowledgeable about computers is not very familiar with baseball and vice versa. Yet, as word decoding does not seem to be domain dependent, it is conceivable that a reader who is good at reading one text in most cases will be good at reading another text, on the condition that the contextual bias is not too great. Many researchers have demonstrated that it is not good readers, but poor readers with deficient word decoding who compensate by relying more on other cues, e.g., contextual information (for a review see Stanovich, 2000). Thus, high performing readers could be expected to have a high, even profile of reading performance.

A substantial number of children will experience great difficulties in acquiring good literacy skills. There are several conceivable reasons for this, as reading indeed is a complex, multidimensional activity. It consists, as mentioned, of word decoding and comprehension, and requires vocabulary, syntactic competence, fluency and the ability to make inferences, etc. Reading performance is also influenced by social and cultural factors, language skills, general aptitude, and intellectual habits. There is no reason to assume that a group of poor readers is a homogenous group. The profiles of performance may vary considerably.

The aim of the present study was to examine different patterns of reading performance. The Swedish part of the IEA Reading Literacy Study, carried out by The International Association for the Evaluation of Educational Achievement (IEA) in 1991, was used as the basis of the subgroup analysis to be reported here. The major aim of the IEA Reading Literacy study was to determine the average level of reading performance among 9-year-old students and 14-year-old students in 32 school systems. The present study will only concern 9-year-old Swedish students.

According to IEA, reading literacy is: "...the ability to understand and use those written language forms required by society and/or valued by the individual" (Elley, 1992 p.3).

On the basis of this definition the reading literacy tasks were composed of three kinds of reading material: narrative prose, expository prose and documents, and the major stress was placed on comprehension. *The narrative texts* ranged from short fables to stories of more than 1000 words. *The expository texts* included factual information or opinions described and explained in continuous texts, for example, a short description of an animal or a more lengthy text on how to determine the age

of a tree. *The documents* included charts, tables, maps, graphs, lists or sets of instruction organized in such a way that students have to search, locate and process selected facts rather than read every word of a text.

The literacy tasks were divided into two booklets, booklet A and booklet B, administered at separate occasions. Booklet A consisted of two narrative, two expository and two document tasks. In booklet B there were two narrative, three expository and four document tasks. Low performance of reading comprehension can for some students be due to slow and/or inaccurate word decoding. Therefore, a speeded word recognition test with highly familiar words was added to the battery, and was included in booklet A. The time restriction was 35 minutes for booklet A and 40 minutes for booklet B. Slow word decoding or dysfluent reading could also be revealed in the so-called end-of-booklet effect (Yang & Gustafsson 2003), that is unexpectedly low performance on tasks at the very end of a booklet. Another dimension of the end-of-booklet effect could be lack of motivation.

The test items were of multiple-choice format. In order to identify various explanatory background variables questionnaires were administered to each student (voluntary reading activities, their homes and their school circumstances), their teachers (background, instructional policies and beliefs) and their school principals (school circumstances and policies).

One important aim of the present study was to develop tools to examine the pattern of reading based on a theoretical analysis of the reading process. The large population in this study, offers a unique opportunity to discover structures and subgroups. The participants were thus assessed on word recognition, document tasks and on continuous texts. The different patterns of reading were exposed by an analytic tool, which has never, to my knowledge, been used in this context previously.

It is important to recognize the heterogeneity of poor readers. If stable and interpretable subgroups can be identified, differential remedial programs can be designed to reflect the complexity of the reading problems. Thus, identifying subgroups has theoretical as well as practical implications.

A second aim of this study was to compare the identified subgroups on different background variables, such as gender*, number of books at home and how often Swedish is spoken at home.*

Potential subgroups of poor readers

One potential subgroup of poor readers is students with low IQ. As word decoding and IQ are not very strongly related (Hoien & Lundberg, 2000), these readers they might not have problems with word decoding itself but with comprehension of reading. This group could be expected to exhibit normal or close to normal word recognition, but low scores on both documents and continuous text.

Another subgroup could be students with immigrant backgrounds. There is no reason to believe that bilingualism inhibits word reading profiency, rather the opposite (Salim & Siegler, 2002). Their exposure to continuous texts might be

limited, but their word decoding could be sufficient to a reasonable extent. However, for these students poor vocabulary might cause a problem. Therefore they might manage short texts, such as the document tasks, better than tasks on continuous texts. In other words, they might have average scores on word recognition, low scores on continuous text and rather low scores on document tasks.

A third subgroup could be students with poor socioeconomic background and insufficient literacy encouragement. They might exhibit generally low scores on all tasks, due to little exposure to reading material.

A fourth potential subgroup of poor readers is expected to be a dyslexic group. The concept of dyslexia will be briefly described here.

This definition of developmental dyslexia (henceforth dyslexia) was adopted by the International Dyslexia Association in November 2002 in cooperation with NICHS (National Institute of Child Health and Human Development):

> Dyslexia is a specific learning disability that is neurological in origin. It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede growth of vocabulary and background knowledge.

Taken together, the underlying primary cause of dyslexia seems to be a deficit in the phonological system, and its core manifestation is slow and error prone word decoding and spelling (see also Hoien & Lundberg, 2000; Snowling, 2000). The problems are often unexpected in relation to other abilities. Although dyslexia is constitutionally based it does not preclude the possibility that environmental factors might influence the manifest reading performance. Thus, early preventive measures and strong family support may decrease the manifest problems. However, the relationship between socioeconomic factors and manifest dyslexic problems is assumed to be rather weak (Lundberg & Olofsson, 1981). Still, one could conceive of a dyslexic child with a very supportive home environment where the dyslexic problems are identified early in pre-school and preventive measures are taken including language stimulation, phonological awareness training and continuous parental support during the first school years. The dyslexic problems of this child might not even be identified in school. Thus, the fact that we are focusing on a biologically based disturbance does not preclude the operation of environmental factors to modify the expression of the constitutional problems.

Hoover and Gough (1990) propose in the simple equation, $R = D \times C$ (Reading = Decoding × Comprehension), that reading is a product of the ability to accurately and fluently identify the words in print and of general language comprehension ability. Students with dyslexia have impaired word-decoding ability but are supposed to have normal comprehension. This implies that they may perform well below average on the word recognition task and on the end-of-booklet task, do better on tasks with

continuous text and even better on document tasks as such tasks require comparatively little reading. However, one risk involved is that deficient reading comprehension occurs as a secondary problem, as a consequence of very poor word decoding.

METHOD

Participants

The 9-year-old students participating in this study were part of the IEA Reading Literacy study in 1991. From the Swedish part of the study 4184 students were included in the analysis. They were selected on the basis of having valid data for both booklet A and booklet B. Out of these 2105 (50.3%) were boys and 2079 (49.7 %) were girls.

Instruments

For the purpose of identifying different profiles of reading performance four aspects were considered. The first aspect was word reading displayed in the word recognition task. The second aspect was connected prose, comprising both narrative and expository texts. An earlier study on the IEA Reading Literacy battery (Balke, 1995) demonstrated that narrative and expository prose formed only one factor. The third aspect was documents. The fourth aspect was reading speed, which was revealed in the word recognition task, and in the end-of-booklet effect. The end-of-booklet effect contains both word reading speed and fluency, i.e., continuous reading speed.

Ten tasks were selected from Booklet A and Booklet B as shown in table 1.

Table 1: Tasks and number of test items in each task classified on four aspects. Abbreviations in brackets

Task	*Connected prose*	*Documents*	*Word reading*	*Speed*
The Walrus (ewlr)	6 items			fluency
The bird and the elephant (nbird)	5 items			
A shark makes friend (nshk)	5 items			
Marmots (emrm)	4 items			
Island (disl)		4 items		
Maria's timetable (dmra)		3 items		
Empty bottles (dbtt)		4 items		
Buses (dbus)		4 items		
Temperature (dtmp)		5 items		
Word recognition (word)			40 items	word

To sum up, then, the empirical basis consisted of a word recognition task, narrative and expository texts indicating comprehension of connected prose and the document tasks indicating more general cognitive processing.

In this study the categorical latent variables identified in Mplus will be compared on the basis of the observed background variables. The information about different background variables was taken from the student questionnaire (gender, number of books at home and how often Swedish is spoken at home).

The study is conducted in two phases. In the first phase sub-groups or profiles are identified, and in the second phase the different patterns of background variables in different profiles are examined.

Methods of analysis

In traditional multivariate analyses the focus is on variables, for example a reading achievement test (dependent variable) is related to variables such as reading habits, instructional practise, amount of homework, socioeconomic background, etc. An alternative approach is to focus on individuals and examine similarities and differences between individuals when a number of variables have been taken into account. Thus, the concern is on configuration, patterns or profiles of variables defining subgroups of individuals. There are several techniques for identifying or confirming the existence of subgroups. Cluster analysis is a general term for a family of techniques for procedures to create classifications. Most methods of cluster analysis are case-centred analyses, compared to factor analysis, which is variable-centred (Croll, 1986). Cluster analysis is a multivariate statistical procedure with the general aim to identify groups of cases or entities called clusters, which are homogenous internally regarding the variables in question. The variables representing the measured characteristics should be of a limited number and clearly interpretable (Rapkin & Luke, 1993).

The method to be used here is *Latent Profile Analysis*, which is a sophisticated variant of cluster analysis. This method has been developed by Muthén (2001) and implemented in Mplus, which will be used under the STREAMS 2.5 modelling environment (Gustafsson & Stahl, 2001). Latent Profile Analysis allows specification of models with categorical latent variables using continuous manifest variables as indicators. Usually it is assumed that the variables are independent within latent classes. If they are associated it is termed "conditional dependence" or "local dependence", and the model must be modified to account for this. In Latent Profile Analysis the best fit of the model is assessed, and the fact that we are operating with latent variables facilitates further statistical calculations.

Raw data as well as standardized data can be used in Mplus. However, standardized values will facilitate an interpretation of the profiles from a theoretical point of view. Therefore, as a first step all students' scores for the nine passages and for word recognition were standardized into z-scores. Thus, continuous manifest variables were used in order to get a number of unobserved categorical latent variables. The latent variables represent the profiles. Each student was not only classified into a certain profile but also given a probability for belonging to each profile.

The model fit was assessed by so-called information criteria. The best-fitting model is received when the Sample-Size Adjusted BIC (the Bayesian Information Criterion) value is as low as possible combined with as high Entropy as possible. The BIC value is a log-likelihood measure used for model selection. It does not require any a priori profile information. Entropy is a measure of disorder in a given dispersion. In latent profile analysis each individual in the sample receives probabilities for each profile. When an individual has high probability for one profile and low probabilities for the remaining profiles the entropy will be high. To determine the number of profiles these methods were combined with a "scree"-type test where levelling-off points of the curves for different Entropy and Sample-Size Adjusted BIC values were found. Confirmation of robust n-profile models is obtained when the Sample-Size Adjusted BIC values and the Entropy remain equal in spite of shifting start values.

RESULTS

First, the procedures of how the number of profiles was revealed will be elucidated. Then, the obtained latent profiles will be presented in relation to gender, number of books at home and how often the students speak Swedish at home. A short description of each profile with respect to patterns of reading performance will follow.

Figure 1 shows the Sample-Size Adjusted BIC values, and figure 2 shows the Entropy for the 2-profile model up to the 16-profile model. The Sample-Size Adjusted BIC value decreased up to a 16-profile model. However, the Entropy measure did not continuously increase, and some profiles proved to be very sensitive to different start values. When scrutinizing the profiles, and weighing the Sample-Size Adjusted BIC value and the Entropy, an 8-profile model was indicated as the best fit of model (Sample-Size Adjusted BIC= 98894.391; Entropy= 0.883.). The Sample-Size Adjusted BIC value and the Entropy were consistent when start values were varied.

Figure 1: Sample-Size Adjusted BIC values for a 2-profile model to a 16-profile model, i.e., number 1 is a 2-profile model, number 2 is a 3-profile model and so forth.

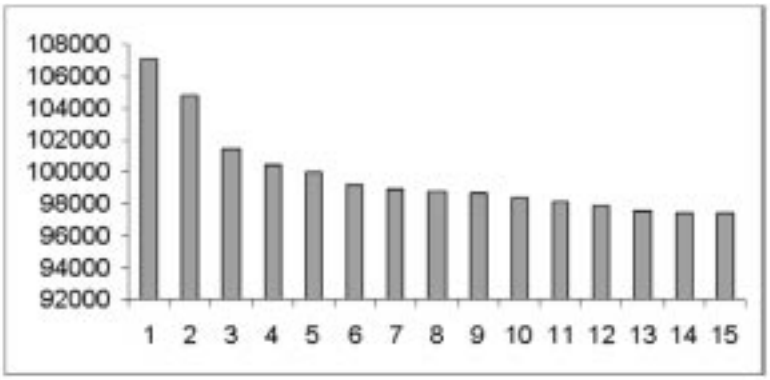
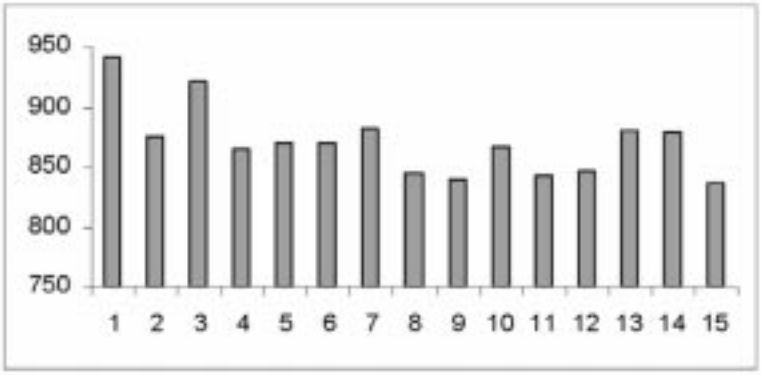


Figure 2: Entropy values for a 2-profile model to a 16-profile model, i.e., number 1 is a 2-profile model, number 2 is a 3-profile model and so forth.



The eight profiles of different patterns of reading performance were each compared successively to the remaining group of students on three background variables as shown in tables 2-4.

Table 2: A comparison between each profile and the remaining group on gender. (Girl = 1, Boy = 2, Total mean = 1.50)

Profile	*M*	*SD*	*t*
1	1.49	–	2.178*
2	1.50	–	0.203
3	1.50	–	0.233
4	1.42	–	2.249*
5	1.51	–	0.215
6	1.55	–	1.139
7	1.58	–	2.124*
8	1.60	–	3.726***

* $p < 0.05$, *** $p < 0.001$

Table 3: How often Swedish is spoken at home. (Total mean = 2.87)

Profile	*M*	*SD*	*t*
1	2.93	0.33	8.427***
2	2.86	0.46	0.881
3	2.86	0.44	0.471
4	2.84	0.47	0.852
5	2.70	0.60	3.977***
6	2.67	0.61	4.068***
7	2.67	0.60	4.774***
8	2.89	0.39	0.759

*** $p \leq 0.001$

Table 4: Number of books at home. (Total mean = 5.12)

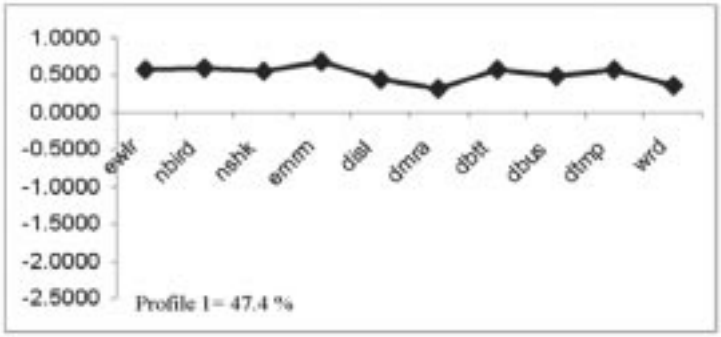
Profile	*M*	*SD*	*t*
1	5.27	1.00	8.300***
2	5.04	1.16	2.155*
3	5.08	1.12	0.614
4	4.97	1.21	1.620
5	4.76	1.39	3.613***
6	4.76	1.42	3.038**
7	4.76	1.53	3.458***
8	5.08	1.27	0.613

* p ≤ 0.05, **p ≤ 0.01, ***p ≤ 0.001

Brief description of the eight profiles

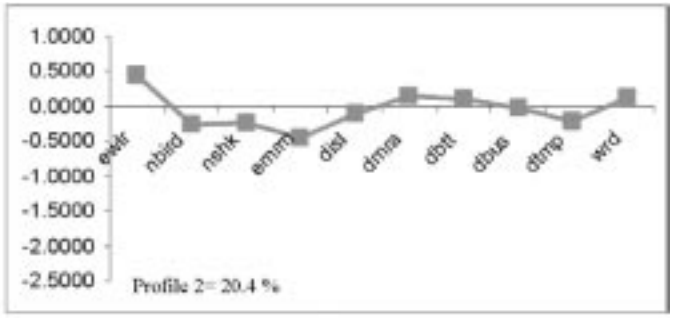
For each performance profile the tasks will follow the same order as depicted in table 1. All scores are standardized. The first task is an end-of-booklet task. The first four tasks (including the previously mentioned) are all tasks on continuous texts, the following five tasks are document tasks and the last task is word recognition.

Figure 3: Scores on the ten reading tasks for Profile 1.



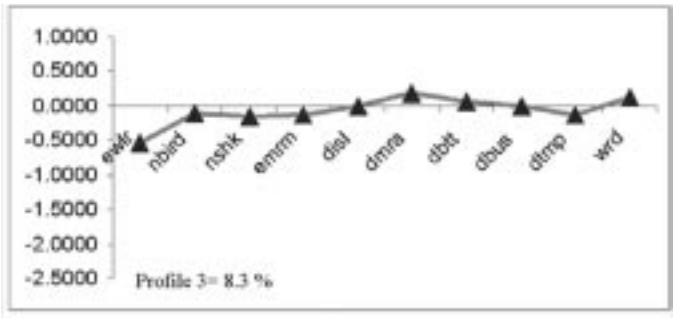
Profile 1 is the largest group including 47.4% of the students. It is a high performing group with an even profile, performing around 0.5 SD above the mean on all tasks. There were significantly more girls in this profile. Also, these students speak Swedish at home more often and they have more books at home.

Figure 4: Scores on the ten reading tasks for Profile 2.



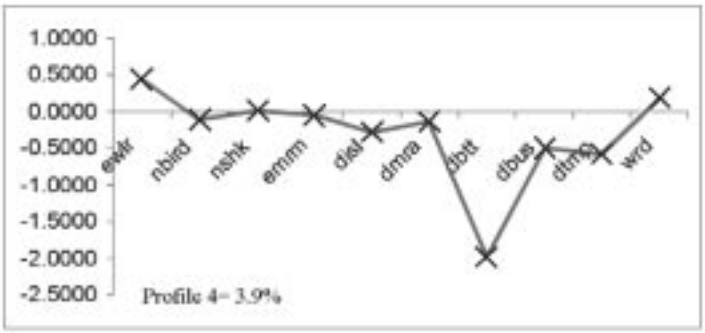
Profile 2 is the second largest group including 20.4 %. It is an average performing group. They performed slightly better on documents than on connected prose. Word decoding and end-of-booklet scores were just above average. Apart from number of books at home, to their disadvantage, there is no significant difference on any other background variable. They speak Swedish at home as often as the remaining group, and there was no gender imbalance.

Figure 5: Scores on the ten reading tasks for Profile 3



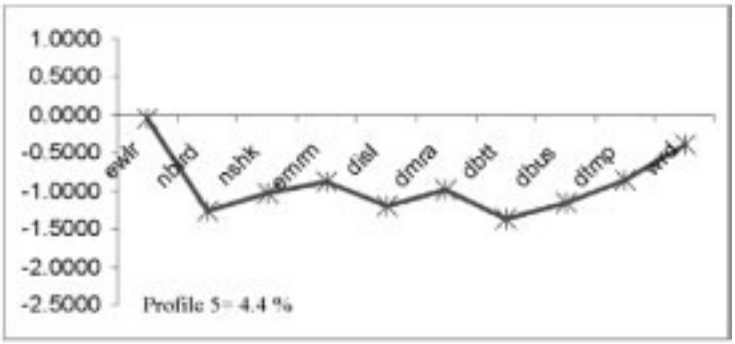
Profile 3 includes 8.3 % of the students. It is an average performing group. Their background data do not differ from the remaining groups.

Figure 6: Scores on the ten reading tasks for Profile 4.



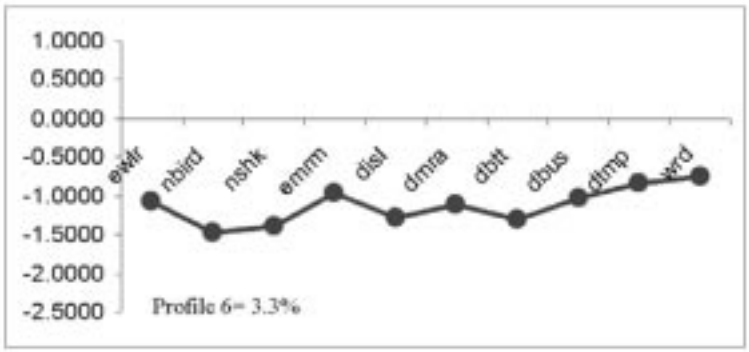
Profile 4 includes 3.9 % of the students. They performed poorly on the document tasks, but performed around average on connected prose and word decoding. Significantly more girls than boys are members of this group. Otherwise, they do not differ significantly from the remaining groups.

Figure 7: Scores on the ten reading tasks for Profile 5



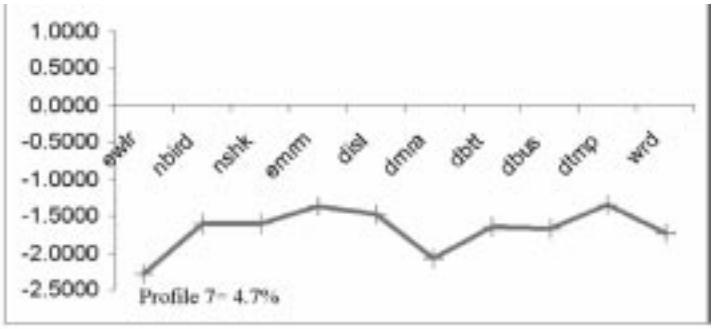
Profile 5 includes 4.4 % of the students. They have average performance scores on word decoding and end-of-booklet. On both connected prose and documents their performance scores are well below the mean (around 1-1.5 SD). There is no gender imbalance in this group, but the students speak Swedish at home less often and they have fewer books at home.

Figure 8: Scores on the ten reading tasks for Profile 6



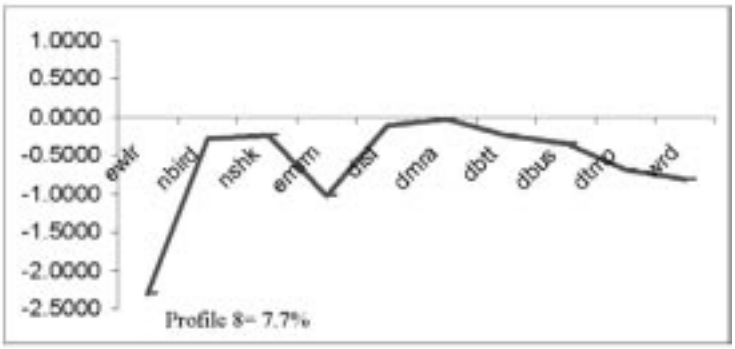
Profile 6 is the smallest profile including 3.3 % of the students. All their performance scores were between 1-1.5 SD below the mean. They speak Swedish less often at home, and they have fewer books at home.

Figure 9: scores on the ten reading tasks for Profile 7



Profile 7 includes 4.7 % of the students. They performed around 1.5-2 SD below the mean on all tasks except the end-of-booklet task, where their scores were almost 2.5 SD below the mean. There are significantly more boys than girls in this profile. They speak Swedish less often at home, and they have a lower number of books at home.

Figure 10: Scores on the ten reading tasks for Profile 8



Profile 8 includes 7.7 % of the students. The average result on the end-of-booklet task in this group was almost 2.5 SD below the mean, and on word decoding it was about 1 SD below the mean. They performed about average on connected prose with the exception of the passage "Marmots". The results on documents were slightly better than on connected prose. There are significantly more boys in this profile. Otherwise they do not differ on the background variables.

DISCUSSION

Eight interpretable profiles were identified. Around 75 % of the sample belonged either to a high performing or an average performing profile. They exhibited good literacy skills irrespective of whether it was a task in the domain of documents, connected prose or word recognition. It appears that a good reader is characterized

by an even profile of good reading which is not dependent on any specific domain of interest. This indicates that reading is a proficiency with a high degree of generality.

Profiles 4, 5, 6, 7 and 8 exhibited different patterns of poor reading performance. One good reason for subgrouping is that it could entail a rejection of the simplistic view that poor readers are a homogenous group. Another good reason for subgrouping is to find different patterns of reading that can form a foundation for educational implications.

There were more girls than boys in Profile 4. This group did well on both word decoding and continuous texts so it is doubtful if they should be labelled poor readers at all. However, they did not reach average performance on document tasks, which require other cognitive skills than fluent reading. This is consistent with other findings (Wagemaker et al., 1996) that girls perform worse on document tasks relative to reading of continuous texts, as compared to boys.

Students in profile 5 speak Swedish less often at home. Their performance profile is in line with the idea that immigrant children do not have to exhibit deficient word recognition skills, but might be deficient in vocabulary, which will result in low comprehension.

Profile 6 and Profile 7 are generally low performers, and the difference in performance scores between them is rather more quantitative than qualitative. In both groups they speak Swedish less often compared to the remaining groups, and they have fewer books at home. This could indicate that the poor performance, at least partly, could be due to little exposure to text. There are more boys in Profile 7, and the students in this profile are also the most impaired readers. The same pattern of more boys among the poorest readers has been observed in other studies (Hoien & Lundberg, 2000). Poor performance on the end-of-booklet task can, apart from deficient reading fluency, also be a sign of lack of motivation. In this case that might be the best way to interpret the dip on the first passage.

The students in Profile 8 exhibited slow and/or error prone word decoding together with low performance on the end-of-booklet task. This is a core symptom of dyslexia (Lundberg, 1999). They performed around average on connected prose with one exception. The dip on passage "Marmots" could be explained by the fact that this passage is close to the end of Booklet B, and around 1-1.5% never reached this passage (Gustafsson, Rosén & Myrberg, 2003). The results on documents were slightly better than on connected prose. This feature of slow and error prone word decoding, combined with sufficient reading comprehension and good cognitive skills (Frith, 1997) when only very limited reading is required seem to fit a dyslexic profile. In line with a dyslexic profile is also the percentage of students (7.2%) included in this profile; a typical frequency of dyslexia in many studies is 5-8 % (e.g., Lundberg, 1985).

To sum up, there were more girls than boys in the highest performing profile, and there were more boys than girls in the lowest performing profiles. The best performing profile had a higher number of books at home, and the lower performing profiles had fewer books at home, with the expected exception of the dyslexic profile. Also, the dyslexic profile spoke Swedish at home as often as the

remaining group, in contrast to the other low-performing profiles, who spoke Swedish at home less often.

The large sample of this study offered a unique opportunity to subgroup students on their reading performance measures. Eight interpretable profiles were obtained. In an ongoing study (Wolff, in preparation) very similar profiles have been identified. The same method, latent profile analysis, was used. The sample is students from the 10-year Trend study 2001. In this forthcoming study various profiles and background data will be examined. In addition to the background data in the present study it will concern further data on cultural and economic capital.

For a future study it would be desirable to have more variables included, such as measures on motivation and more unambiguous measures on word decoding and fluency. As dyslexia is basically a phonological deficit, tasks measuring phonological abilities would be highly valuable in the efforts to identify a dyslexic profile.

Latent profile analysis appeared to be a relevant analytic tool, not least because of the promising cross-validation of profiles in the RL 2001-sample.

References

Balke, G. (1995, April). *Decomposition of reading comprehension. Analysis of the IEA reading literacy tests.* Paper presented at the AERA conference in San Fransisco, USA.

Croll, P. (1986). *Systematic classroom observation.* London: The Falmer Press.

Elley, W.B. (1992). *How in the world do students read?* The International Association for the Evaluation of Educational Achievement.

Gough, P. (1995). The new literacy: caveat emptor. *Journal of Research in Reading, 18*, 79-86.

Gustafsson, J-E. & Stahl, P-A. (2001). *STREAMS User's guide, Version 2.5 for Windows95/98/NT.* Mölndal, Sweden: Multivariate Ware.

Gustafsson, J-E., Rosén, M. & Myrberg, E. (2003). *Förändringar i läskompetens 1991-2001. En jämförelse över tid och länder* (Changes in competence of reading. A comparison over time and countries). Skolverket, Sweden.

Hoien, T & Lundberg, I. (2000). *Dyslexia. From theory to intervention.* Dordrecht NL: Kluwer Academic Publishers.

Hoover, W. & Gough, P. (1990). The simple view of reading. *Reading and Writing: An Interdisciplinary Journal, 2*, 127-160.

Lundberg, I. & Olofsson, Å. (1981). Dyslexielevers sociala bakgrund (Social background of dyslexic students). *Nordisk tidskrift för specialpedagogok, 59*, 203-213.

Lundberg, I. (1985). Longitudinal studies of reading and writing difficulties in Sweden. In G.E. McKinnon & T.G. Waller (Eds.), Reading research: *Advances in theory and practice* (pp. 65-105). New York: Academic Press.

Lundberg, I. (1999). Towards a sharper definition of dyslexia. In I. Lundberg, F.E. Tonnessen, & I. Austad (Eds.), *Dyslexia. Advances in theory and practice.* (pp. 9-29). Dordrecht, NL: Kluwer Academic Publishers.

Muthén, L.K. & Muthén, B.O. (2001). *Mplus user' s guide (2nd edition)*. Los Angeles, CA: Muthén & Muthén.

Rapkin, B.D. & Luke, D.A. (1993). Cluster analysis in community research: Epistemology and practice. *American Journal of Community Psychology*, *21* (2), 247-277.

Salim, A-R. & Siegel, L. (2002). Reading, syntactic, orthographic, and working memory skills of bilingual Arabic-English speaking Canadian children. *Journal of Psycholinguistic Research, 31*, 661-678.

Snowling, M. (2000). *Dyslexia*. Oxford: Blackwell Publishers Ltd.

Stanovich, K.E. (2000). *Progress in understanding reading*. New York: The Guilford Press.

Wagemaker, H., Taube, K., Munck, I., Kontogiannopoulou-Polydorides, G. & Martin, M. (1996). *Are girls better readers? Gender differences in reading literacy in 32 countries*. Amsterdam: IEA.

Yang, Y & Gustafsson, J-E. (2003). Measuring Socioeconomic Status at Individual and Collective Levels. (Paper accepted for publication in *Educational Research and Evaluation*).