The relationship between motivational components and reading competency of Hungarian-speaking children in three countries

A secondary analysis of the PIRLS 2001 and 2006 data[1]

Éva D. Molnár
University of Szeged, Szeged, Hungary

László Székely
Szent István University, Gödöllő, Hungary

In the 2001 and 2006 Progress in Reading Literacy Study (PIRLS) assessments, the language of tuition of all or some of the students in three of the participating countries, namely, Hungary, Romania, and the Slovak Republic, was Hungarian. This present study drew on the PIRLS data from these countries in order to explore connections between motivational components of reading competency and the students' reading achievement on the PIRLS assessment instrument. The motivational components included attitudes toward reading and reading-related self-concept. The study also considered the factors that appeared to influence these components. Analysis involved construction of two hierarchical linear models for each country and data-collection time (i.e., 2001 and 2006). Because the educational systems of the three countries are similar, the study also compared the findings of the hierarchical linear modeling across the three countries.

1 The study was funded by the Developing Diagnostic Assessments Project of the School Renewal Operative Programme of the New Hungarian Development Plan (TÁMOP 3.1.9. – Diagnosztikus mérések fejlesztése).

INTRODUCTION

Hungary's participation, since 1991, in international large-scale assessments of students' reading achievement changed the research culture in Hungary. The results of studies conducted by the International Association for the Evaluation of Educational Achievement (IEA) and the Organisation for Economic Co-operation and Development (OECD) studies highlighted, for Hungary, the importance not only of regularly assessing this area of educational achievement but also of systematically studying students' acquisition of the basic skills of reading. The results, moreover, provided Hungary with a valuable new set of national reading-achievement benchmarks.

However, the international surveys presented an ambiguous picture of Hungarian students' achievement. The findings of iterations of the IEA Progress in International Reading Literacy Study (PIRLS) show that the reading literacy of Hungarian 10-year-olds is highly satisfactory (Balázsi, Balkányi, Felvégi, & Szabó, 2008). The OECD Programme for International Student Assessment (PISA) surveys, however, present a far less positive picture (OECD, 2004, 2007). It is important to note, at this point, that comparison of the findings of the two survey programs cannot be fully justified because they are based on different theoretical constructs and measure different age groups. Nevertheless, these seemingly conflicting results for Hungary deserve further consideration.

We took a step in this direction in the present study. Our aim was not to compare the PIRLS and PISA data but rather to conduct research that, in association with existing research and later studies, might contribute to explanations for the ostensible differences in reading achievement between the younger and older populations of Hungarian students. Our particular interest in this study centered on possible relationships between indices of students' motivation to read and students' reading competency. To this end, we conducted two detailed analyses. The first examined the relationship between students' attitudes toward reading and students' reading competency. The second addressed the relationship between students' self-reported perceptions of their reading ability and students' reading competency. Because an important issue in reading research concerns the question of what factors influence the development of attitudes toward reading and reading-related self-concept, we considered several of the background details, such as home environment, typically collected from students participating in international studies of educational achievement. The data that we used for our analyses came from the PIRLS databases for 2001 and 2006 and included the results for the Hungarian-speaking Grade 4 populations of Hungary, the Slovak Republic, and Romania. The five-year span between the two assessments allowed us to compare, across time, the relationships between the two motivational indices and reading achievement for students who spoke Hungarian but studied in different schools systems and in different countries.[1]

1 Native speakers of Hungarian live not only in Hungary but also in several neighboring countries, including the Slovak Republic and Romania. Both of these countries have large numbers of people who are native (generally monolingual) speakers of Hungarian.

BACKGROUND CONSIDERATIONS

Understandings of Reading Acquisition and Their Relevance to Assessments of Reading Competency

Analysis directed at understanding influences on reading competence has been a central concern of theorists and researchers for many years. According to Cs. Czachesz (2005), research on the attainment of reading skills has been influenced, over time, by five theoretical frameworks—empirical-behaviorist, psycholinguistic and sociolinguistic, cognitive psychological, constructivist, and motivated learning. These paradigms have taken us from understanding reading as a simple decoding skill to understanding it as a complex functional skill, acquisition of which is influenced by such contexts as the reader's social environment, previous knowledge, personal interpretation, and personal interests and attitudes (Nagy, 2006).

International large-scale assessments of reading, such as PIRLS and PISA, address three main areas of interest:

1. Reading skills, assessed through tasks that require students to engage in specific processes—retrieve information, form a broad general understanding, develop an interpretation, reflect and evaluate (OECD, 2000, 2006);
2. Reading competence, assessed through students' ability to engage with and comprehend different types of text, such as narrative, document, and explanatory (PIRLS), and different forms of text, such as continuous and non-continuous (PISA); and
3. The sociocultural and socioeconomic contexts within which reading takes place (PIRLS, PISA).

Drawing on contemporary research, the research teams responsible for designing PIRLS and PISA developed the following conceptions of reading literacy. In PIRLS,

> reading literacy is defined as the ability to understand and use those written language forms required by society and/or valued by the individual. Young readers can construct meaning from a variety of texts. They read to learn, to participate in communities of readers in school and everyday life, and for enjoyment. (Mullis, Kennedy, Martin, & Sainsbury, 2006, p. 3)

In PISA, reading literacy is defined as "understanding, using, and reflecting on written texts, in order to achieve one's goals, to develop one's knowledge and potential, and to participate in society" (OECD, 2003, p. 108). Both definitions emphasize the ability to use reading as a tool to achieve certain goals, but because the two surveys assess different age groups, the definitions are operationalized slightly differently.

PIRLS concentrates more on students' ability to function appropriately in the typical environment in which they read, whereas PISA focuses more on students acquiring reading literacy in order to benefit society. Nonetheless, both definitions relate reading literacy to everyday functioning. This form of literacy is, therefore, not simply about the ability to decode certain texts; it is also about learners using, in everyday situations, their reading skills and the information that they have acquired through reading.

The first IEA assessment of reading in which Hungary participated (the Study of Reading Comprehension 1968−1972) focused on the behavioral aspects of reading, namely, decoding and reproduction. The tasks used to assess these competencies measured reading comprehension, reading speed, and vocabulary (Cs. Czachesz, 2001). The results of this assessment, conducted with students in Grade 4, influenced how reading is taught in Hungary. The second IEA assessment, modified by the experience of the first assessment, defined reading not merely as decoding, but also as a process involving functionality. This second assessment, again involving Grade 4 students, was thus augmented by a new domain of competence, that of understanding charts and diagrams, a skill which reflects a general ability to cope with everyday tasks (Cs. Czachesz, 2001). The results of both assessments showed that, by the end of Grade 4, 10-year-old Hungarian students were, in general, competent readers who had acquired the basic skills of reading.

The third and fourth assessments—PIRLS 2001 and PIRLS 2006—also focused on the reading competence of Grade 4 students. The texts used in this study included ones concerned with reading for literary experience and texts concerned with reading to acquire and use information (Mihály, 2003). Four basic processes were distinguished—*focus on and retrieve explicitly stated information, make straightforward inferences, interpret and integrate ideas and information*, and *examine and evaluate content, language, and textual elements* (Mullis, Martin, & Gonzalez, 2004).

The acquisition of reading competence does not happen independently of characteristics unique to the learner. Variables related to motivational aspects such as attitudes toward learning and school as well as personal goals and self-concept appear to be associated with students' reading skills and engagement. For example, students who express positive attitudes toward reading—who say they like to read and who consider themselves to be good readers—read more often for recreational purposes and choose a wider variety of texts to read than do students who do not express such attitudes (Mullis, Martin, González, & Kennedy, 2003).

The more recent international assessments of reading literacy have evaluated students' acquisition of basic skills within the context of students' learning motives and learning strategies because of the assumption that effective skill development is associated with positive learning characteristics (see, for example, Haahr, Nielsen, Hansen, & Jakobsen, 2005). The PIRLS iterations of 2001 and 2006 considered the motivational components associated with students' attitudes toward reading and students' self-rating (self-concept) of their reading skills. The PISA 2000 and 2003 assessments considered four motivational characteristics—intrinsic motivation, extrinsic motivation, sense of belonging to school, and attitudes toward learning. PIRLS 2006 and PISA 2000 and 2003 also considered reading efficacy, that is, students' confidence in their ability to engage effectively with texts.

Multivariate analyses of data from these studies suggest that approximately 10% of the variance in reading results can be explained by students' attitudes toward reading (Haahr et al., 2005). However, according to Haahr et al. (2005), positive attitudes are

neither sufficient nor necessary for good results. The authors observed that students in both Finland and Japan achieved, on average, good reading-competency results in PIRLS and PISA despite gaining relatively low scores on the attitudinal scale.

In Hungary, both the international and the national publications on PIRLS reported little association between reading ability and attitudes. Even students with low scores on the attitude index achieved relatively high scores on the reading ability test (see Balázsi et al., 2008). Self-concept, however, showed a relationship with reading ability. Students who gained high scores on the self-concept index scored significantly higher on the reading test than did students with low scores on the self-concept index. Despite achieving higher overall scores on the PIRLS reading assessment test in 2006 than in 2001, the Hungarian students were more likely to appear in the low self-concept category in 2006 than they were in 2001. Thus, more students in 2006 than in 2001 said that they could not read well (Balázsi et al., 2008).

The Hungarian-Speaking Students Assessed in PIRLS 2001 and 2006

In 2001, a group of 35 countries took part in PIRLS (Mullis et al., 2003); in 2006, 40 countries did so (Mullis, Martin, Kennedy, & Foy, 2007). All three countries that are the focus of our present study participated in both assessments, allowing us to compare the data we examined not only across time but also cross-culturally. Table 1 presents a summary of the size of the populations for which data were collected in both years.

The education systems of the three countries are very similar in the initial stages, that is, up to approximately Grade 4. There are no crucial differences between the system of majority and minority education[2] in the Slovak Republic and Romania, although there are some differences in the curricula for the two areas of this system. All three countries have decentralized education systems, which means that schools can decide what to include in their curricula and how to run their schools, as long as

Table 1: The PIRLS 2001 and 2006 selected samples in the three countries

Country/ language of test	Year	Number of schools	Number of classes	Number of students	Total weight
Hungary/Hungarian	2001	216	216	4,666	117,238
	2006	149	196	4,068	104,649
Romania/Hungarian	2001	4	4	127	7,379
	2006	10	12	185	6,861
Slovak R./Hungarian	2001	12	12	170	4,167
	2006	22	31	566	3,674

Note: The numbers of schools and classes were equal in 2001 because only one class per sampled school was chosen during the selection procedure. The total weight shows the number of students represented by the selected sample.

2 The term "minority education" refers to educational provision for students from an ethnic grouping that speaks a language (e.g., Romanian) other than Hungarian. "Majority education" refers to education for students whose first language is the language used by the majority of the population (in the case of our study, Hungarian).

they heed the central government's national directives and standards for education. In Romania, the government introduced a curriculum framework for primary schools at the beginning of the 1998/99 school year, and implemented revisions to it in 2001 and 2003. Each country must use one of the reading-curriculum textbooks approved by the Ministry of Education. There are only two such books in the Slovak Republic, but many options in the other two countries. The number of reading classes per week varies between seven and nine, depending on grade level. The structure of preservice and inservice teacher training is similar in all three countries.

Since 2004, teachers in Hungary have been required to conduct an analytical written assessment of their students' reading achievement at the end of each of the first three grades of school and at the end of the first semester of the fourth school year. In the Slovak Republic, teachers conduct an oral assessment of their students' reading ability at the end of the first grade (see Felvégi & Ostorics, 2007; Lukackova & Obrancova, 2007; Noveanu & Sarivan, 2007). The populations of students included in this present study for Romania and the Slovak Republic all completed the tests in Hungarian.

METHOD

Variables Considered

As we noted earlier, the PIRLS 2001 and 2006 surveys took into account students' attitudes toward reading in order to obtain data that might help explain students' reading literacy scores. In PIRLS, attitudes encompassed the following categories: "student's attitudes toward reading," "student's self-concept regarding his/her reading ability," "student's attitudes toward school," and "student's reports of problematic behavior by other students at school." Our study focused on the first two categories only—*student's attitudes toward reading*, and *student's self-concept regarding his/her reading ability*. We considered both as "motivation to learn" variables.

Attitudes toward reading were measured in PIRLS with the following statements: "I read only if I have to," "I like talking about books with other people," "I would be happy if someone gave me a book as a present," "I think reading is boring," "I need to read well for my future," and "I enjoy reading." Students responded to each statement by marking their preference on a four-point Likert scale: *disagree a lot* = 1, *disagree a little* = 2, *agree a little* = 3, and *agree a lot* = 4. Because some statements were negative in meaning, coding was reversed for these statements. A cumulative "attitudes toward reading" index was developed from the students' averaged scores on these items. The index had three categories: *high* (values between 3 and 4 on the Likert scale), *medium* (values between 2 and 3), and *low* (values between 1 and 2). Students in the high category agreed with most of the statements.

A four-point Likert scale was also used in the student questionnaire with respect to students' self-concept of their reading ability. The 2001 iteration of PIRLS contained the following statements: "Reading is very easy for me," "I do not read as well as other students in my class," "When I am reading by myself, I understand almost everything I read," and "Reading aloud is very hard for me." In 2006, the fourth question was

modified to read: "I read slower than other students in my class." In 2001, the third statement was not included in the self-concept index, which again comprised the average of students' scores. In 2006, all four statements were taken into account during development of the index. In both years, the index had three categories of self-concept—high, medium, and low. Students with a high index considered themselves to be good readers and trusted in their ability to understand what they read. As was the case with the attitude-toward-reading items, reverse coding was used for self-concept items that were negative in orientation.

Analyses

When analyzing PIRLS data, one has to take into account sampling error and the fact that the students' results were weighted. To obtain descriptive statistics and correlation coefficients between two variables, we used the IEA International Database Analyzer (IEA, 2005), which is a free-to-download plug-in for SPSS.

Also, because the PIRLS data are nested, we used hierarchical linear modeling (HLM; see, for example, Raudenbush & Bryk, 2002) to ascertain associations between learning motives and reading literacy. We used two 2-level HLM models, in which individuals were placed on the first level, and classes/schools were placed on the second level. In an effort to determine what association, if any, school and class had with students' reading performance, we constructed our first model as a one-way analysis of variance (ANOVA) with random effects, and reading achievement as the dependent variable. Our second model was a random-coefficient HLM in which attitude and self-concept indices were the Level 1 predictors and reading achievement was the dependent variable. Both predictors were centered around their group means. The results from the first model allowed us to calculate the proportions of variance in reading achievement scores explained by these indices. The HLM software that we used during our analyses was developed by Raudenbush, Bryk, Cheong, Congdon, and du Toit (2004).

RESULTS AND INTERPRETATIONS

Comparison Between Countries and Across Time of Reading Achievement

Table 2 provides the mean reading achievement scores and their standard errors for the students in each country who participated in the two PIRLS assessments. The table also states the language(s) in which the reading assessment was presented in each country.

It is important, when considering the information in Table 2, to note that the achievement scores are not equal to the means of the students' raw test scores. In order to obtain these, and thereby set the scale for international comparison, the PIRLS research team used item response theory (IRT) techniques to analyze the students' reading achievement. The responses were then subjected to a conditioning process, which provided the probability distribution of the achievement of each

Table 2: Reading achievement of students in the three countries on the PIRLS 2001 and 2006 assessments, by language of test

Country	Language of test	2001			2006		
		Number of students	*Mean*	*s. e.*	*Number of students*	*Mean*	*s. e.*
Hungary	Hungarian	4,666	543.23	2.20	4,068	550.89	2.98
Romania	Romanian	3,498	511.06	4.68	4,088	488.49	5.09
	Hungarian	127	535.98	9.41	185	516.99	9.16
	Romania jointly	3,625	511.71	4.59	4,273	489.47	5.01
Slovak Republic	Slovakian	3,640	516.06	2.97	4,814	532.26	2.91
	Hungarian	170	550.76	8.59	566	511.63	7.64
	Slovak R. jointly	3,810	518.09	2.85	5,380	530.81	2.75

student, given student responses and background data. These posterior distributions of achievement led to drawing a sample of five elements (plausible values), which, as a set, represented the expected proficiency and the uncertainty associated with the measure (see also von Davier, Gonzalez, & Mislevy, 2009).

The IRT analysis allowed the definition of a common scale of reading achievement across the countries, which was then transformed to have 500 points as the international average (the PIRLS average) and 100 points as the standard deviation. Application of this rescaling transformation to the set of plausible values for a student's or a country's average score allows one to establish a student's or a country's level of achievement. The benefit of the conditioning model is that it improves the reliability of the achievement measurement (for details, see Martin, Mullis, & Kennedy, 2007; Mullis et al., 2007) while preserving (through the use of plausible values) an accurate measure of the remaining uncertainty.

The 500 points average established in 2001 changed in 2006 because of the participation of additional countries. However, the original *PIRLS average* was kept to 500, while the *international average* was established as 492, thus allowing the results for individual countries to be compared to both averages.

To determine whether a country achieved above the PIRLS average, the international average, or another reference score at the 95% confidence level, it is necessary to calculate the confidence intervals for each country's average score. The lower boundary of a confidence interval equals the mean score minus 1.96 times the standard error; the upper boundary is the mean score plus 1.96 times the standard error. If 500 falls within a country's confidence interval, then that country's mean score is not statistically different from the 500-point score. However, if the lower boundary of the confidence interval of that country's mean score is greater than 500, then its achievement is significantly higher than the international average. Its achievement is lower if the upper boundary is less than 500. In order to compare the average achievement of students of two countries, or of students from the same country at different occasions, independent samples *t*-tests can be applied.

All three countries that we considered achieved significantly above the PIRLS-average (500 point) in the 2001 PIRLS assessment. In the Slovak Republic, the Hungarian-speaking students gained significantly higher test scores (t = -2.86, p = .004) than the students of the majority population in the country, that is, the Slovakian-speaking students. In Romania, the difference in scores between the achievement of the Hungarian-speaking students and the Romanian-speaking students was not statistically significant (t = -0.87, p = .384).

In 2006, however, students in Romania (including those in the Hungarian-speaking subsample) scored significantly lower than they had in 2001 (t = 3.21, p = .001). Although the students in the Slovak Republic achieved a higher mean reading score in 2006 than in 2001, there was a significant decline in the performance of the Hungarian subsample (t = 3.76, p = .000). In 2006, Hungarians from Hungary significantly outperformed the Hungarian-speaking minorities in the neighboring countries (t = 2.86, p = .004 and t = 2.46, p = .014), but there were no significant differences between the achievement of the Hungarian minorities in the Slovak Republic (M = 511.63, t = -0.39, p = .696) and Romania (M = 516.99). Note that because the numbers of students in the Romanian-Hungarian and Slovakian-Hungarian subsamples were relatively small, the standard errors of their mean scores tended to be somewhat higher than the mean scores for all participating students in those countries.

As mentioned earlier, we used a one-way ANOVA with random effects to gain some idea of the degree of association between schools and reading performance. (Note that the within- school variance obtained from this model was necessary for further calculations.) Table 3 shows that, except in Romania in 2001, all between-school differences were significant. The exception may be due to the small number of schools in that specific sample. Overall, across the two time periods, the within-school differences were always higher than the between-school differences for all three subsamples.

Table 4 provides a summary of the findings of our analysis of reading achievement data for 2006. We were not able to consider class-level data for 2001 because each school that participated in the PIRLS assessment of that year was represented by one class only. As is evident from Table 4, all between-class variances were significant, and the within-class differences were larger again than those values for each subsample in each country.

Table 5 presents the results of our calculation of the between-class correlation coefficients, which is the proportion of the variance between groups and the total variance (Raudenbush & Bryk, 2002), for both the school level and the class level at the two data-collection times. The highest variance occurred in the Hungarian-speaking subsample in the Slovak Republic. Here, the between-school and within-school variances accounted for between 35 and 40% of the total variance in reading achievement; the proportion at the class level was even greater, at 43%. The smallest school-level and class-level differences to emerge were those for the Hungarian-speaking Romanian subsample. In Hungary, the school-level variance of 25% was

Table 3: Differences in reading achievement of students in the three countries on the PIRLS 2001 and 2006 assessments, by country and school level

Country/ language of test	Year	Fixed effect			Random effect			
		Coeff.	*s. e.*	*Between sch.* τ_{00}	*Within sch.* σ^2	*df*	χ^2	*p*
Hungary/Hungarian	2001	543.41	2.69	902.27	3272.53	215	1377.39	0.000
	2006	547.35	3.60	1242.86	3667.73	148	1426.69	0.000
Romania/Hungarian	2001	540.20	5.06	1.00	5332.63	3	1.39	> 0.5
	2006	522.08	12.66	548.19	4572.61	9	28.05	0.001
Slovak R./Hungarian	2001	538.05	20.39	2872.80	4325.06	11	63.60	0.000
	2006	502.44	13.42	2510.31	4636.46	21	226.77	0.000

Table 4: Differences in reading achievement of students in the three countries on the PIRLS 2006 assessment, by country and class level

Country/ language of test	Year	Fixed effect			Random effect			
		Coeff.	*s. e.*	*Between class* τ_{00}	*Within class* σ^2	*df*	χ^2	*p*
Hungary/Hungarian	2006	547.73	3.36	1400.86	3538.74	195	1661.7	0.000
Romania/Hungarian	2006	522.48	11.96	615.36	4449.56	11	34.83	0.000
Slovak R./Hungarian	2006	503.95	12.22	3013.02	4057.09	30	335.52	0.000

Table 5: Intra-class correlation values, by school level and class level

Country/language of test	Year	Intra-class correlation *School level*	Intra-class correlation *Class level*
Hungary/Hungarian	2001	0.22	–
	2006	0.25	0.28
Romania/Hungarian	2001	0.00	–
	2006	0.11	0.12
Slovak R./Hungarian	2001	0.40	–
	2006	0.35	0.43

marginally lower than the 28% of the respective class level. The high school- and class-level variances in reading achievement in the Hungarian subsample in the Slovak Republic may have been partly due to the very low numbers of students in the subsamples.

The Relationship Between Reading Literacy Achievement and Learning Motives

Table 6 presents the means and standard errors on the attitude and self-concept indices for the three countries at the two data-collection points. Here we can see that, of the subsamples of participating Hungarian-speaking students, the Romanian subsample held the most positive attitudes in both 2001 and 2006. Across the subsamples, attitudes toward reading and self-concept barely changed between 2001 and 2006; the differences were too slight to be statistically significant.

Table 6: Attitudes toward reading and reading-related self-concept indices for 2001 and 2006

	Attitude index				Self-concept index			
	2001		*2006*		*2001*		*2006*	
Country/language of test	*Mean*	*s. e.*	*Mean*	*s. e.*	*Mean*	*s. e.*	*Mean*	*s. e.*
Hungary/Hungarian	3.00	0.02	2.98	0.02	3.04	0.02	3.03	0.02
Romania/Hungarian	3.22	0.06	3.08	0.10	2.93	0.23	2.82	0.06
Slovak R./Hungarian	3.15	0.08	2.97	0.07	2.93	0.05	3.04	0.04

The next two tables present the reading achievement scores for the three index groups (high, medium, low) for attitudes toward reading (Table 7) and reading self-concept (Table 8). For both indices, no substantial differences could be observed between 2001 and 2006 in any of the countries represented. Students who gained the higher scores on the attitude index tended to achieve higher reading achievement scores, but those whose scores placed them low on the index also achieved relatively high scores. The pattern of achievement scores on the self-concept index was a little more complex than the pattern for the attitude index. We can see, in Table 8, that the highest reading achievement scores were obtained by those students with high self-concept scores and the lowest achievement scores were obtained by those students with low self-concept scores. In Hungary, those students with lower self-concept scores, that is, the students who did not consider themselves good readers, gained scores below the international mean scores for 2001 and 2006. In 2001, all Hungarian-speaking Romanians, irrespective of their self-concept index, outperformed the international mean. In 2006, the average achievement score of the Hungarian-speaking students in the Slovak Republic who had a medium self-concept was below the international mean of 492 score points.

Table 7: Differences in reading achievement of students in the three countries on the PIRLS 2001 and 2006 assessments, by attitudes-toward-reading index categories

Country/language of test	Category	2001			2006		
		% of students	*Mean*	*s. e.*	*% of students*	*Mean*	*s. e.*
Hungary	Low	9.22	522.93	4.18	10.60	531.03	3.09
	Medium	37.64	526.48	2.32	37.78	533.23	4.18
	High	47.81	565.08	2.64	49.02	571.25	2.91
Romania/Hungarian	Low	0			4.21	459.18	25.51
	Medium	37.39	521.58	16.55	33.90	497.61	17.79
	High	55.67	550.62	7.92	49.95	541.18	7.72
Slovak R./Hungarian	Low	1.97	504.57	77.71	10.04	485.72	17.26
	Medium	44.20	546.91	13.75	37.29	493.35	11.77
	High	52.89	556.84	10.38	47.88	535.42	8.64

Note: Students who did not answer one or more of the five questions were excluded from the analysis.

Table 8: Differences in reading achievement of students in the three countries on the PIRLS 2001 and 2006 assessments, by self-concept index categories

Country/language of test	Category	2001			2006		
		% of students	*Mean*	*s. e.*	*% of students*	*Mean*	*s. e.*
Hungary/ Hungarian	Low	6.90	485.45	5.13	4.00	497.43	7.20
	Medium	43.64	525.12	2.37	49.29	531.41	3.33
	High	45.59	572.94	2.12	44.46	579.50	2.69
Romania/ Hungarian	Low	5.24	542.16	106.24	9.53	450.53	15.33
	Medium	57.70	527.69	19.18	54.79	509.57	9.89
	High	35.74	553.15	9.30	34.00	551.30	11.57
Slovak R. /Hungarian	Low	10.32	469.99	28.53	3.86	423.01	28.51
	Medium	45.07	545.76	9.55	44.50	486.99	7.36
	High	38.92	570.05	10.03	47.60	546.91	8.64

Note: Students who did not answer one or more of the three (2001) or four (2006) questions were excluded from the analysis.

Table 9 presents the correlations between the attitude index and reading achievement and between the self-concept index and reading achievement. We used Fisher's z transformation to determine the significance of these relationships. In each subsample, reading-related self-concept showed a statistically stronger correlation with reading achievement than attitudes toward reading. This finding led us to the tentative conclusion that, at the age of 10, Hungarian-speaking children's perception of their own reading competence is more closely associated with reading achievement than with whether or not they like reading.

Table 9: Correlations between the attitudes-toward-reading and self-concept indices and reading achievement

Country/language of test	Attitude index				Self-concept index			
	2001		*2006*		*2001*		*2006*	
	Corr.	*s. e.*	*Corr.*	*s. e.*	*Corr.*	*s. e.*	*Corr.*	*s. e.*
Hungary	0.31	0.02	0.27	0.02	0.47	0.01	0.42	0.02
Romania/Hungarian	0.28	0.18	0.28	0.12	0.31	0.18	0.42	0.08
Slovak R./Hungarian	0.13	0.13	0.28	0.07	0.32	0.11	0.50	0.05

Note: All values significant at the $p \leq .05$ level.

On observing the individual subsamples more closely, we found that while the correlation coefficients significantly decreased between 2001 and 2006 in Hungary, the correlation coefficients for the Hungarian subsample in the Slovak Republic were higher in the 2006 study than in the 2001 assessment. In Romania, the change in the correlation coefficients between attitudes toward reading and achievement was not significant. The highest correlation observed for the Hungarian subsample of the Slovak Republic was between reading-related self-concept and reading achievement ($r = .50$) in 2006.

outcomes, educational expectations, educational policy, and economic situation. Given this context, our analysis could act as the initial stage of a larger comparative study of the interactions of state, family, and school variables on student achievement after a period of educational policy integration.

Our sample reflected the wide spread of GDP per capita observed in the Heyneman-Loxley (1982, 1983) and the Baker et al. (2002) studies. The GDP per capita, reported on the basis of purchasing power parity (PPP) in 2003, of the countries in our analysis ranged from $1,800 in Moldova to $37,700 in Norway. In the original analysis by Heyneman and Loxley (1982), the GDP per capita ranged from $117 in India to $5,362 in the United States of America.

Table 1: Countries considered in TIMSS data analyses focused on factors influencing student achievement

Heyneman and Loxley (1982)	Heyneman and Loxley (1983)	Baker et al. (2002)	Present study
Australia	Argentina	Australia	Basque Ct.
Belgium (Flemish)	Australia	Austria	Belgium (Flemish/French)
Belgium (French)	Belgium (Flemish)	Belgium (Flemish)	Bulgaria
Chile	Belgium (French)	Belgium (French)	Cyprus
England	Bolivia	Canada	England
Finland	Botswana	Colombia	Estonia
Germany	Brazil	Cyprus	Hungary
Hungary	Chile	Czech Republic	Italy
India	Colombia	Denmark	Latvia
Iran	Egypt	England	Lithuania
Italy	El Salvador	France	Macedonia
Japan	England	Germany	Moldova
Netherlands	Finland	Greece	Netherlands
New Zealand	Germany	Hong Kong	Norway
Scotland	Hungary	Hungary	Romania
Sweden	India	Iceland	Russia
Thailand	Iran	Ireland	Scotland
USA	Italy	Israel	Serbia-Montenegro
	Japan	Korea	Slovakia
	Mexico	Kuwait	Slovenia
	Netherlands	Latvia	Sweden
	New Zealand	Lithuania	
	Paraguay	Netherlands	
	Peru	New Zealand	
	Scotland	Norway	
	Sweden	Portugal	
	Thailand	Romania	
	Uganda	Russian Federation	
	USA	Singapore	
		Slovakia	
		Slovenia	
		Spain	
		Sweden	
		Switzerland	
		Thailand	
		USA	

the PIRLS 2006 survey. The data for Hungary showed no significant changes between the PIRLS 2001 and 2006 assessments.

The correlations between the other background factors and reading achievement that we examined (e.g., early reading activities in the home, engagement in the reading activities outside school, reading magazines, parents' reading habits) were insufficiently strong to warrant presenting them here. We also observed no significant differences between the subsamples.

Table 11: Correlations between attitudes toward reading and self-concept indices and index of home educational resources

Country/language of test	Attitude index				Self-concept index			
	2001		*2006*		*2001*		*2006*	
	Corr.	*s. e.*	*Corr.*	*s. e.*	*Corr.*	*s. e.*	*Corr.*	*s. e.*
Hungary	0.16	0.02	0.18	0.02	0.19	0.02	0.19	0.02
Romania/Hungarian	0.20	0.02	-0.20	0.10	0.14	0.11	0.30	0.15
Slovak R./Hungarian	0.12	0.06	0.21	0.07	0.11	0.05	0.29	0.07

Note: All values significant at the $p \leq .05$ level.

SUMMARY AND CONCLUSIONS

In our study, we analyzed and compared Hungarian-speaking students' reading achievement data from PIRLS 2001 and 2006 for Hungary, the Slovak Republic, and Romania. We examined the relationships between reading achievement and motivational components (attitudes toward reading and reading-related self-concept) and reading achievement, and we compared these relationships across subsamples and between the two PIRLS data-collection points (2001 and 2006).

Our findings need to be interpreted cautiously given that our analyses were characterized by the limitations of cross-sectional studies and given that we were not able to draw basic causal inferences. As such, our results should be treated as merely indicative; they should not be used for drawing long-term conclusions about students' reading achievement in the three countries and factors potentially influencing that achievement.

The Hungarian students living in Hungary who participated in PIRLS achieved significantly higher reading scores in the 2006 study than in the 2001 study. In contrast, the reading achievement scores of the Hungarian-speaking students in the Slovak Republic and Romania dropped significantly between the two time periods. Reading achievement differences appeared mostly within schools and classes; thus, individual differences in achievement were larger between students and were independent of

3 This index was based on students' responses to two questions about home educational resources—number of books in the home, and educational aids in the home (computer, study desk/table for own use, books of one's own, access to a daily newspaper), and on parents' responses to two questions—number of children's books in the home, and parents' educational attainment (refer Balázsi et al., 2008, p. 44).

the students' schools. This tendency was observed in all three subsamples. This was a surprising result for Hungary, because the PISA study indicated that differences across schools in Hungary were the highest of any of the participating countries, possibly because of the high degree of selectivity into the differentiated secondary schools of the Hungarian education system (OECD, 2004). It appears, though, albeit on the basis of data from the two different programs of assessment (PISA and PIRLS), that these between-school differences hold for secondary schools, but not for primary schools.

Although the education systems in the three countries are similar in terms of majority and minority educational provision, and although nothing of significance occurred that might have influenced the results of the 2001 and 2006 assessments, our analyses of the data from both assessments for the three countries under consideration highlighted contradictory outcomes. The reading performance of students in Hungary improved noticeably between the two periods, but the performance of the minority Hungarian-speaking students in Romania, as well as of the Romanian students, in general, deteriorated markedly. The performance of the students overall in the Slovak Republic also improved significantly between 2001 and 2006, but the performance, on average, of the minority Hungarian-speaking students in that country deteriorated considerably.

As for the relationships between the attitudes-toward-reading and self-concept indices and reading achievement, we found that reading-related self-concept was more closely associated than attitudes with achievement in each country. This finding led us to the tentative conclusion that students' perceptions of their own reading competence is a more reliable predictor of students' reading achievement than is liking or not liking reading.

We used two HLM models to determine correlations between reading competency and motives. The results of our one-way ANOVA with random effects regarding the differences between schools, classes, and individual students were compatible with the results of a Hungarian assessment of reading competency of fourth graders (Csapó, Székely, & Tóth, 2009). PISA results, however, show that differences between schools were highest in Hungary, which, as previously mentioned, has a particularly strong system of school selectivity at the secondary level (OECD, 2004, 2007). The differences between PIRLS and PISA can be explained by the different assessment frameworks used in the two programs of assessment, as well as by the sample selection processes employed in the two studies.

Our second model was a two-level random-coefficient hierarchical linear model in which the attitudes and self-concept indices served as Level 1 predictors. The explanatory potential of the two indices regarding variance in reading achievement was the same for all subsamples of students, except for the Slovakian subsample of 2006, where it was higher and reached a level of about 35% to 40%. The reason for this difference in results cannot be explained by the variables we used; the reason may relate to a specific process associated with education policy.

We found only weak correlations between the motivational variables (attitudes toward reading, reading-related self-concept) and the student background factors (encompassed in the index of home educational resources) that supposedly influence the former. The number of books in the home, having a study desk or table for one's own use, having access to a daily newspaper, and parents' educational qualifications had minor, but consistently positive, associations across all subsamples and both assessment cycles with how much the students liked reading and their perceptions of their own reading competence. Low correlations between the attitudes and the self-concept indices and the various student background variables that we considered thus offered low explanatory potential. However, because the economic backgrounds of the three countries involved are similar, we were not surprised by this finding.

In conclusion, we could find no essential differences between the subsamples with respect to the studied factors. Although significant differences between the countries could be identified for certain factors, no country could be singled out as showing a pattern diverging from the other countries in either a positive or a negative direction.

References

Balázsi, I., Balkányi, P., Felvégi, E., & Szabó, V. (2008). *PIRLS 2006 summary report on the reading literacy of 10-year-old students in Hungary*. Budapest, Hungary: Hungarian Educational Authority.

Cs. Czachesz, E. (2001). Ki tud olvasni? Nemzetközi összehasonlító vizsgálatok és magyar eredményeik [Who can read? International comparative assessments and Hungarian results]. *Iskolakultúra*, *11*, 21–30.

Cs. Czachesz, E. (2005). Változó perspektívák az olvasási képesség pedagógiai értelmezésében: Út a készségtől a motivált jelentéskonstrukcióig [Changing perspectives in the pedagogical interpretation of reading skills]. *Iskolakultúra*, *15*, 44–52.

Csapó, B., Székely, L., & Tóth, E. (2009). *Az iskolai különbségek változása egy longitudinális vizsgálat adatai alapján* [Variations of school differences based on a longitudinal assessment], in press.

Felvégi, E., & Ostorics, L. (2007). Hungary. In A. M. Kennedy, I. V. S. Mullis, M. O. Martin, & K. L. Trong (Eds.), *PIRLS 2006 encyclopedia* (pp. 165–172). Chestnut Hill, MA: Boston College.

Haahr, J. H., Nielsen, T. K., Hansen, M. E., & Jakobsen, S. T. (2005). *Explaining student performance: Evidence from the international PISA, TIMSS and PIRLS surveys*. Aarhus, Denmark: Danish Technological Institute.

International Association for the Evaluation of Educational Achievement (IEA). (2005). *IEA International Database Analyzer* (IEA IDB Analyzer). Retrieved from http://www.iea.nl/iea_studies_datasets.html

Lukackova, Z., & Obrancova, E. (2007). The Slovak Republic. In A. M. Kennedy, I. V. S. Mullis, M. O. Martin, & K. L. Trong (Eds.), *PIRLS 2006 encyclopedia* (pp. 363–372). Chestnut Hill, MA: Boston College.

Martin, M. O., Mullis, I. V. S., & Kennedy, A. M. (2007). *PIRLS 2006 technical report.* Chestnut Hill, MA: Boston College.

Mihály, I. (2003). Nemzetközi olvasásvizsgálat: PIRLS 2001 [International reading assessment: PIRLS 2001]. *Új Pedagógiai Szemle*, *53*, 201−211.

Mullis, I. V. S., Kennedy A. M., Martin, M. O., & Sainsbury M. (2006). *Assessment framework and specifications*. Chestnut Hill, MA: Boston College.

Mullis, I. V. S., Martin, M. O., & Gonzalez, E. J. (2004). *International achievement in the processes of reading comprehension: Results from PIRLS 2001 in 35 countries*. Chestnut Hill, MA: Boston College.

Mullis, I. V. S., Martin, M. O., González, E. J., & Kennedy, A. M. (2003). *PIRLS 2001 international report: IEA's study of reading literacy achievement in primary schools in 35 countries*. Chestnut Hill, MA: Boston College.

Mullis, I. V. S., Martin, M. O., Kennedy, A. M., & Foy, P. (2007). *PIRLS 2006 international report*. Chestnut Hill, MA: Boston College.

Nagy, J. (2006). Olvasástanítás: A megoldás stratégiai kérdései [Teaching reading: Solutions to strategic issues]. In J. Krisztián (Ed.), *Az olvasási képesség fejlődése és fejlesztése* [Development and improvement of reading skills]. Budapest, Hungary: Dinasztia Tankönyvkiadó.

Noveanu, G. N., & Sarivan, L. (2007). Romania. In A. M. Kennedy, I. V. S. Mullis, M. O. Martin, & K. L. Trong (Eds.), *PIRLS 2006 encyclopedi*a (pp. 317−326). Chestnut Hill, MA: Boston College.

Organisation for Economic Co-operation and Development (OECD). (2000). *Measuring student knowledge and skills: The PISA 2000 assessment of reading, mathematical and scientific literacy*. Paris, France: Author.

Organisation for Economic Co-operation and Development (OECD). (2003). *The PISA 2003 assessment framework: Mathematics, reading, science and problem-solving knowledge and skills*. Paris, France: Author.

Organisation for Economic Co-operation and Development (OECD). (2004). *Learning for tomorrow's world: First results from PISA 2003*. Paris, France: Author.

Organisation for Economic Co-operation and Development (OECD). (2006). *Assessing scientific, reading and mathematical literacy: A framework for PISA 200*6. Paris, France: Author.

Organisation for Economic Co-operation and Development (OECD). (2007). *PISA 2006: Science competencies for tomorrow's world: Executive summary*. Paris, France: Author.

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (2nd ed.). Thousand Oaks, CA: Sage.

Raudenbush, S. W., Bryk, A. S., Cheong, Y. F., Congdon, R., & du Toit, M. (2004). *HLM 6: Hierarchical linear and nonlinear modeling*. Lincolnwood, IL: Scientific Software International.

von Davier, M., Gonzalez, E., & Mislevy, R. (2009). What are plausible values and why are they useful? *IERI Monograph Series: Issues and Methodologies in Large-Scale Assessments*, *2*, 9–36.