Home Literacy Environment and Reading Achievement:

A Model for Determining the Relationship between Socio-Economic Status, Home Literacy Environment and Reading Achievement

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Abstract

Numerous studies have examined the importance of the home literacy environment (HLE) for the development of children's reading achievement and the relationship between a family's socio-economic status (SES) and the HLE. Furthermore, research has shown that there is a strong correlation between SES and children's school achievement.

In this paper, we ask whether HLE can explain the relationship between SES and school achievement. In other words: to what extent does the intensity of HLE in families with diverse SES account for the higher academic achievement of students from high-SES families?

Using PIRLS 2006 data for 29 countries and applying the Rasch model, we constructed an index to quantify students' HLE. In this index different variables of the PIRLS 2006 home questionnaire are considered, including certain early home literacy activities, parental attitudes, and the involvement of families in supporting their children's reading in school.

We also conducted path analyses to examine the relationship between SES, HLE and reading achievement in the participating countries.

Key words: *home literacy environment, reading achievement, social deprivation, Rasch measurement*

Introduction

The importance of the home literacy environment (HLE) for children's reading achievement has been analyzed in numerous studies (for an overview see, for example, McElvany, 2008). HLE encompasses the resources and opportunities in families that support the development of children's reading skills at home. Research has established the importance of early literacy experience in the family context for young children's (pre-)literacy skills and for later reading achievement (Gunn, Simmons, & Kameenui, 1995; Lonigan, 2006; Whitehurst, & Lonigan, 2001; for an overview see Centre for Community Child Health, 2004).

All international achievement studies show a correlation throughout all participating countries between the socio-economic status (SES) of families' and students' school achievement. Children who are privileged to grow up in a family with a higher SES perform better in school than students from underprivileged families. Several factors may be taken into consideration when addressing the relationship between SES and school achievement. In this paper we will explore the extent to which intensity of HLE accounts for the higher academic achievement of students from high-SES families.

In the 'Learning to Read Survey' in PIRLS 2006 parents of participating students were asked to provide information on their family background. The questionnaire contains several items addressing aspects of the home literacy environment. For the purpose of the International Report of PIRLS 2006 (Mullis, Martin, Kennedy & Foy, 2007) the information gathered from the questions relevant to HLE was presented in the form of two indexes, with different cut-off points for "high", "medium" and "low" levels, where a high index level "corresponds to conditions or activities generally associated with good educational practice and high reading achievement" (Mullis, Martin, Kennedy & Foy, 2007, p. 106). The Index of Early Home Literacy Activities (EHLA) is based on parents' responses regarding frequency of literacy-related activities they engaged in with their child prior to his/her entry into primary school (e.g., reading books). The Index of Home Educational Resources (HER) combines parents' responses regarding the amount of educational resources and the number of children's books in the home with parents' level of education.

For our research we decided to use an index with a continuous scale (Stubbe, Buddeberg, Hornberg, & McElvany, 2007) that was developed using Rasch measurement (Rasch, 1960). This index allows extensive quantification of HLE in families. It combines different aspects of HLE and also includes factors such as family literacy activities that support formal reading instruction in school, parental attitudes towards literacy, and parental reading behaviours, thus creating an overall index for HLE.

Home Literacy Environment

Abundant research has provided insight into the importance of home environments for children's reading literacy development. Children's early literacy experiences lay the foundation of the learning-to-read process prior to formal schooling. Literacy experiences include a broad range of family activities, such as exposure to literacy, parent-child storybook and picture book reading, as well as opportunities for literacy interactions between the family members. Parents can support their children if they engage in literacy-related activities with them (see, for example, Leseman & de Jong, 2001). To encourage children to explore literacy

families must have access to print resources and literacy materials. In particular it is necessary that books and children's books are available in a household. Parents' attitudes to reading activities have an impact on the home literacy environment, as they determine the extent to which parents themselves get involved in activities and encourage their children to do so. Parents who engage in many literacy activities with their children foster the development of positive attitudes to reading (Sonnenschein & Munsterman, 2002). From a rich literacy environment positive effects can be expected with respect to early language skills and emergent literacy, which in turn support the development of reading competencies (Bus, van IJzendoorn, & Pellegrini, 1995; Senechal, & LeFevre, 2002).

A rich home literacy environment is important not only for the early years of childhood, but also for supporting the formal learning-to-read process at school. The parental role model is especially important in motivating students and influencing attitudes to reading and learning.

Using the German PIRLS 2006 data Tarelli (in press) investigated whether, and to what extent, HLE, measured as a one-dimensional construct, can be used to explain the relationship between the SES of a family and the reading achievement of students at the end of fourth grade. The core question is whether children who grow up in families with lower SES, but which nevertheless provide a high intensity of HLE, achieve better results in reading. The analyses showed that to a certain extent HLE may explain the relationship between SES and reading achievement. However, to a substantial extent the direct correlation between SES and reading achievement remains. As the correlation between SES and HLE is particularly high in Germany, it was argued that an investment in programmes and/or measures that target families with lower SES might help change this situation. For that reason an international comparison is desirable. In this paper we will expand the analysis and take into consideration more countries, namely those which participated in PIRLS 2006 and are members of either the EU or the OECD. We will examine whether, on an international level, the results are comparable or whether there are countries in which HLE can play a greater role.

Research Questions

In the empirical section of this paper we will reproduce some of the results from Tarelli (in press) for the other EU or OECD member states that participated in PIRLS 2006. We will thereby test the following hypotheses:

1. The different aspects of HLE (parents' engagement in literacy activities prior to the child's entry into primary school, parents' engagement in literacy activities during primary school, parents' attitudes towards literacy, their reading behaviour, and the availability of literacy material in the household) can be internationally modelled as a one-dimensional construct

using Rasch scaling.

2. There is a positive relationship between the HLE index score and reading achievement in all countries.

3. There is a positive relationship between families' SES and HLE in all countries.

4. The well-established relationship between families' SES and the reading achievement of their children can partly be explained by the families' HLE.

Data and Methods

The empirical analyses conducted for this paper are based on data from PIRLS 2006 (Progress in International Reading Literacy Study). Information for 130,508 students and their families in 29 participating EU or OECD countries is available. No comparable data is available for the United States, as the 'Learning to Read Survey' was not conducted there.

For our analyses we used the reading achievement data, an index for HLE based on 25 items from the home questionnaire (see results), and an indicator for the families' SES. We used the question "What principal kind of work do the child's father (or stepfather or male guardian) and mother (or stepmother or female guardian) do?". We then defined skilled agricultural or fishery workers, craft or trade workers, plant or machine operators and general laborers as low-SES, small business owners, clerks and service or sales workers as medium-SES, and corporate managers or senior officials, professionals, technicians and associate professionals as high-SES.

We used AM (http://am.air.org/) for descriptive statistics and regression analyses and Mplus 5 (Muthén & Muthén, 2007) for path analyses. Data were weighted according to the PIRLS 2006 User Guide (Foy, & Kennedy, 2008) with the student house weight.

Results

In the 'Learning to Read Survey' which was included in PIRLS 2006 parents were asked to provide information on several factors related to the HLE of their family. If possible, the selected items were summarized in scales that cover the main aspects of HLE (Stubbe, Buddeberg, Hornberg & McElvany 2007). The items that enquired how often parents engaged in literacy activities (e.g., reading books or telling stories) with their child prior to entry into primary school were summarized in a first scale (cronbach's alpha: .77). A second scale comprised those items relating to family literacy activities that support formal reading

instruction at school (cronbach's alpha: .72). Parental attitudes to literacy and parental reading behaviours were combined in a third scale (cronbach's alpha: .81). Additionally, the number of children's books was taken as an indicator of the availability of literacy materials and resources in the household.

For the construction of an overall index to quantify students' HLE, a one-parameter (1pl) IRT model (Rasch model) was applied. In this index the 25 variables taken from the 'Learning to Read Survey' were considered. The reliability of the scale (WLE person separation reliability) is .84 and therefore satisfactory.

Figure 1 shows the average index scores for HLE in the EU or OECD countries that participated in PIRLS 2006. The HLE scale was designed to have a mean of 300 and a standard deviation of 60.

[Take in Figure 1 about here]

In Scotland and England the average HLE was about half a standard deviation greater than the international average. In four of the Canadian provinces, as well as in New Zealand, Iceland and Norway, the index scores were also substantially above the international average. Low values were found in Romania, the Flemish Community in Belgium, Bulgaria, Austria, and Luxembourg. Noticeably, the variance of the index was especially great in Bulgaria and Romania. While the standard deviation varied between 49 (Latvia) and 66 (New Zealand) in the other countries, the deviation was 79 in Romania and 85 in Bulgaria. As shown by the percentiles these values were caused by outliers in the lower part of the scale.

Based on current research on HLE it can be assumed that students from families with a high index score for HLE would perform better on the PIRLS reading assessments. Table 1 presents the average HLE and the average reading achievement as well as the proportion of variance in reading achievement explained by the HLE index score for the different countries. The greater this latter value, the stronger the relationship is between families' HLE and students' reading achievement. Thus, low values might indicate that the educational systems of the particular countries compensate for differences in students' homes.

[Take in Table 1 about here]

By far the strongest correlation between HLE and reading achievement was found in Romania. One fifth of the variance in reaching achievement could be explained by the HLE index score. In Luxembourg this proportion was about 10 percent. Also in the Slovak Republic, in the French Community in Belgium and in France and Austria the correlation between the two variables was quite strong. Less than 4 percent of the reading achievement variance of

fourth-grade students could be explained by HLE in Sweden, the Canadian province of Alberta, Norway, Slovenia, Denmark, Lithuania and Latvia.

Based also on current research we assume that the HLE will be stronger in families with high SES and weaker in families with low SES. Figure 2 shows the difference in the HLE index score between families with high and low SES. At first glance it appears that a correlation between SES and HLE could be found in the assumed direction in all countries.

[Take in Figure 2 about here]

In Scotland, the Canadian province of Nova Scotia, New Zealand, England and Iceland families with low SES had an average HLE index score above the scale average of 300. In the other countries the HLE for low-SES families varied between 229 (Bulgaria) and 296 (Alberta). Only in the Flemish Community in Belgium was a HLE index score of less than 300 found in the high-SES group, while the largest value was found in Scotland (346).

Statistically significant differences above the international average were found in Bulgaria (96 points), Romania (70 points), and Luxembourg (54 points). In most countries with generally high HLE values the correlation to SES was relatively weak. The differences between the two groups, namely students from families with high SES and students from families with low SES, were 27 points in Nova Scotia, 32 point in Scotland and 36 points in New Zealand. Also, in Eastern Europe countries such as in Latvia, Poland, Lithuania, and Iceland the social disparities were comparatively small.

These findings lead to the assumption that the primary effects of social origin (the connection between families' SES and students' academic achievement) can partly be explained by students' HLE. Figure 3 shows the corresponding path model with the students' gender and immigrant background included.

[Take in Figure 3 about here]

Table 2 presents the results of 29 path analyses (one for each country) according to the model displayed in Figure 3.

[Take in Table 2 about here]

The left side of the table shows the relationship between reading achievement and different variables (HLE, students' gender, immigrant background, and SES of the student's family). The centre of the table shows the relationship between the described background variables and HLE. Thus HLE is modelled as a mediator between students' background and reading achievement (for illustration compare with Figure 3). The columns on the right of the table

show the extent to which the model can explain the differences in reading achievement and HLE. Paths that are not significant are labelled 'ns'. Countries are ordered according to the column that shows the degree of explanation of reading achievement. The table shows that the results vary between the different countries. The highest explanatory proportion for reading achievement is shown for Romania, where 27 percent of the reading achievement is explained by the model. In Romania the relationship between HLE and reading achievement is .38, which means that children who live in families with intensive HLE have higher reading achievement (as measured by the assessment of PIRLS 2006). The correlation between SES and HLE is also rather distinctive (.41), which means that children with a more privileged family background enjoy a richer HLE. The relationship between SES and reading achievement is reflected in the value .22, which shows that children from disadvantaged backgrounds tend to perform lower in reading tests.

A comparison of the results from all the countries in Table 3 shows that the relationship between HLE and reading achievement varies greatly – from .38 in Romania to .06 in Lithuania. Values above or at .20 were also found in the Slovak Republic (.23), New Zealand (.21), Austria (.20) and Italy (.20). Fifteen countries scored higher than .15, which was the score for Germany.

The highest correlation between SES and HLE was found in Bulgaria (.50), which was even higher than in Romania. The lowest, but still distinctive, values were obtained in Latvia (.18) and in the Canadian province of Nova Scotia (.18).

The highest correlation between SES and reading achievement was found in Hungary (.39), Slovenia (.35) and Lithuania. In these countries the correlation between HLE and reading achievement was also rather low.

A comparably low correlation between SES and reading achievement (below .20) was found in Italy, the Canadian provinces of Alberta, British Columbia, Quebec and Ontario, and in Austria. The correlation between HLE and reading achievement was higher than .15 for all of the countries mentioned, and was even above .20 in Austria and Italy.

We conclude that in all countries a significant correlation between (1) SES and HLE, (2) SES and reading achievement, and (3) HLE and reading achievement can be found. However, substantial differences were found between countries regarding the degree of variance in reading achievement that can be explained by the model and in the question whether the direct path from SES to reading achievement dominates (e.g., in Slovenia) or if social disparities can be explained by HLE (e.g., in Austria).

Discussion

The analyses showed great variation among the participating countries regarding home literacy environment. Substantial differences were found between the participating countries concerning the extent of HLE and the correlation with reading achievement. Furthermore, the HLE of students from privileged families was found to be significantly higher than those of students from underprivileged families. These results may be attributed to different policies and approaches towards the promotion of HLE. The assumption that students from families with a rich HLE achieve higher scores in reading (as measured by the PIRLS reading assessments) holds true for many countries.

Because correlation between families' HLE and students' reading achievement is lower in some countries than in others, we assume that certain educational systems have found ways to compensate for disadvantages regarding HLE. If that is true, deeper analysis of the measures taken in those countries to address this disadvantage would be desirable. Especially in those countries that show a close correlation between HLE and reading achievement, it is important for teachers and educators to become aware of the problems associated with this disadvantage. Children that start formal reading instruction without any prior knowledge of literacy concepts and lack any pre-literacy skills may encounter greater difficulties in the development of literacy competencies. Growing up in an environment that does not support and encourage reading will probably lead to lower motivation to endure a difficult learning process and make it almost impossible for the children to find pleasure in learning to read. If teachers are attentive towards these problems and find ways to respond to the inherent repercussions, they can make a contribution to compensating for the disadvantages.

Preschool children who have enjoyed a rich HLE, and thus have already experienced literacy from an early age, enter school with a head start in reading literacy, proportionate to their preschool years, compared to those children who were not exposed to a rich HLE. The advantages include knowledge about principles of language and texts, pre-literacy skills such as phonological awareness, and understanding the importance of literacy. This fact indicates that the time of entering primary school is rather late for compensation. Therefore it is important that measures to foster reading development in the family are taken at an earlier stage. The implementation of family literacy programmes, especially for families with low academic background, could be one way to help reduce social disparities (McElvany, & Artelt 2009).

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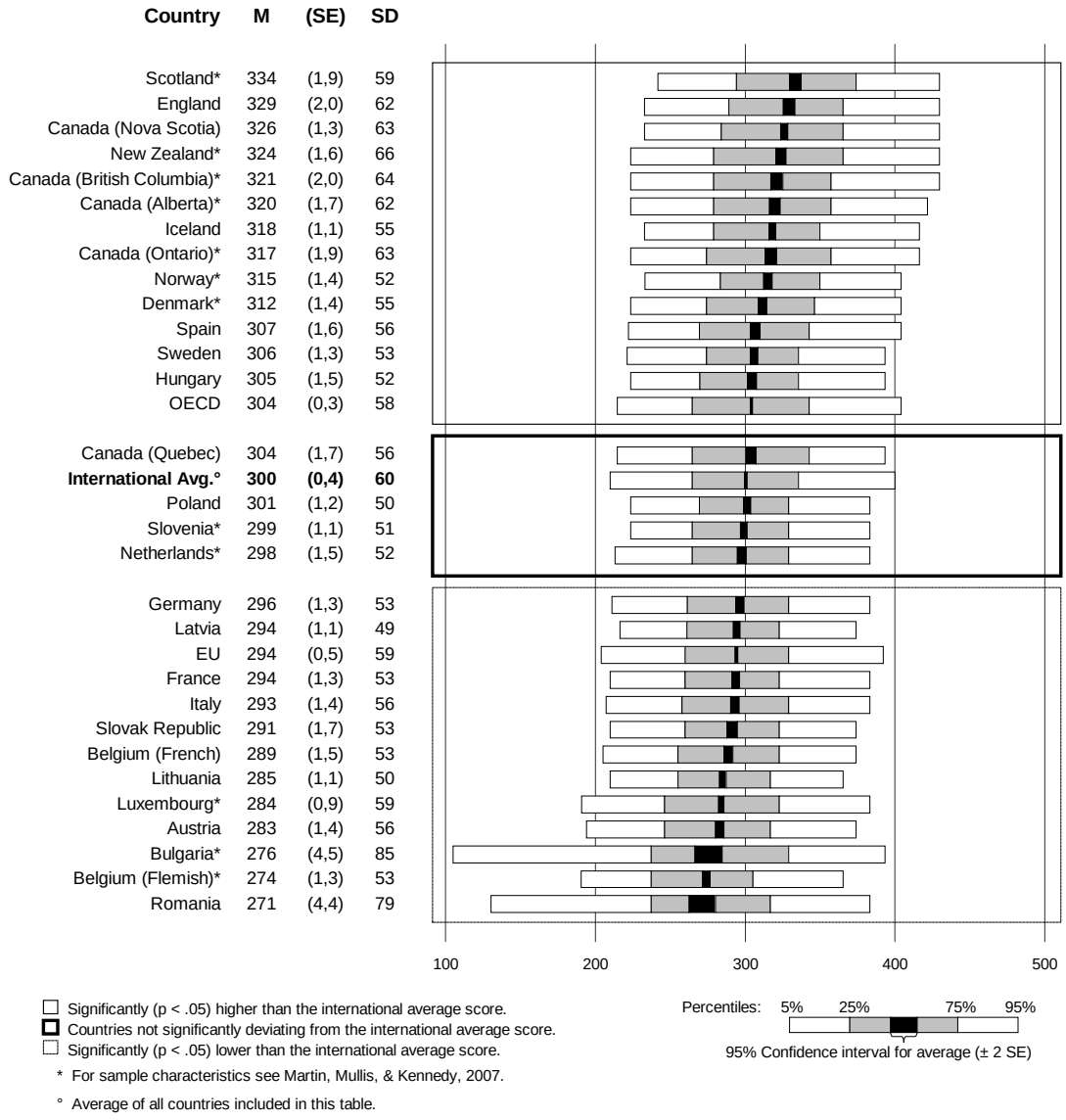
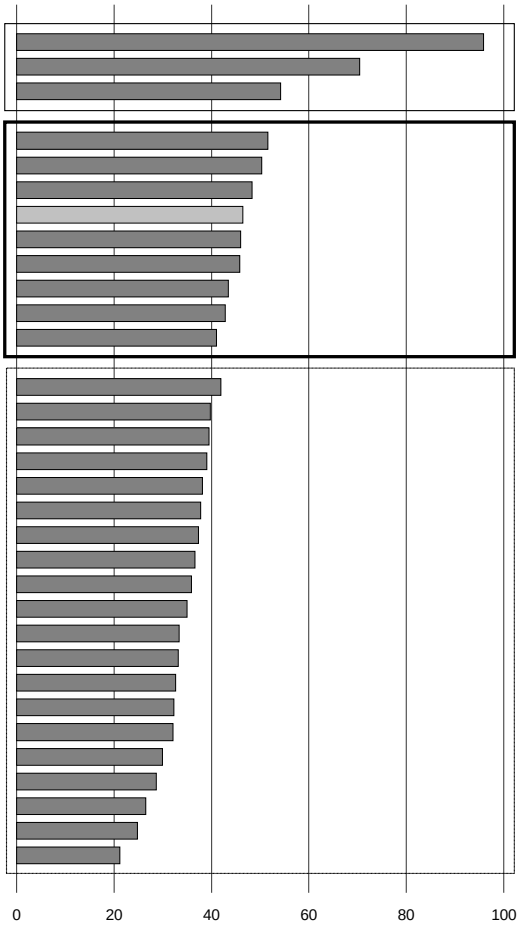


Fig. 1: Distribution of the index of home literacy environment scores of students tested in PIRLS 2006, by percentiles, by country

Country	High SES M	Low SES M	Difference[1]
Bulgaria*	325	229	96
Romania	331	260	70
Luxembourg*	313	259	54
Austria	311	259	52
Italy	324	274	50
Germany	321	272	48
International Avg.°	**322**	**276**	**46**
Spain	332	286	46
EU	317	272	46
Canada (British Columbia)*	337	294	43
Hungary	329	286	43
Netherlands*	313	272	41
OECD	324	282	42
Belgium (French)	308	269	40
Slovenia*	319	279	40
France	314	275	39
England	342	303	38
Canada (Ontario)*	332	294	38
Denmark*	326	289	37
Canada (Alberta)*	332	296	37
New Zealand*	341	305	36
Sweden	318	283	35
Canada (Quebec)	318	284	33
Norway*	327	294	33
Slovak Republic	310	277	33
Belgium (Flemish)*	289	256	32
Scotland*	346	314	32
Lithuania	301	271	30
Iceland	330	301	29
Canada (Nova Scotia)	338	311	27
Poland	315	290	25
Latvia	306	285	21



☐ Significantly ($p < .05$) higher than the difference of the international average score.
☐ Countries not significantly deviating from the international average score.
☐ Significantly ($p < .05$) lower than the difference of the international average score.

* For sample characteristics see Martin et al., 2007.

° Average of all countries included in this table.

[1] Because results are rounded to the nearest whole number, some totals may appear inconsistent.

Fig. 2: Differences between the HLE index scores of children from families with high SES and children from families with low SES, by country

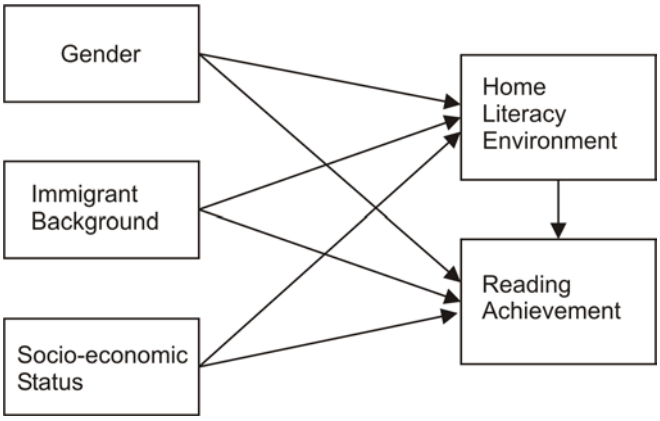


Fig. 3: Path model for the connection between SES, HLE, and reading achievement

Table 1: Percentages of variance in reading achievement explained by HLE index, by country

Country	Index of home literacy environment	Reading achievement (combined literacy scale)	Explained variance (in percent)
Romania	271	489	20.9
Luxembourg*	284	557	9.6
Slovak Republic	291	531	9.0
Belgium (French)	289	500	7.5
France	294	522	7.5
Austria	283	538	7.4
Spain	307	513	6.6
EU	294	534	6.5
Germany	296	548	6.3
England	329	539	6.2
Italy	293	551	6.1
International Avg.°	**300**	**535**	**5.9**
New Zealand*	324	532	5.7
Bulgaria*	276	547	5.6
Scotland*	334	527	5.6
Netherlands*	298	547	5.5
Poland	301	519	5.3
Hungary	305	551	5.3
Belgium (Flemish)*	274	547	5.2
Canada (Quebec)	304	533	5.1
OECD	304	536	5.1
Iceland	318	511	4.9
Canada (Nova Scotia)	326	542	4.6
Canada (Ontario)*	317	555	4.5
Canada (British Columbia)*	321	558	4.2
Sweden	306	549	3.7
Canada (Alberta)*	320	560	3.5
Norway*	315	498	3.3
Slovenia*	299	522	3.2
Denmark*	312	546	3.2
Lithuania	285	537	2.1
Latvia	294	541	1.7

* For sample characteristics see Martin et al., 2007.
° Average of all countries contained in this table.

Table 2: Results of the path analyses for the relationship between SES, HLE, and reading achievement, by country

	Reading achievement on				HLE on			R^2	
	HLE	Gender	Migration	SES	Gender	Migration	SES	Reading achievement	HLE
Romania	0.384	0.079	ns	0.216	ns	ns	0.411	0.270	0.169
Luxembourg *	0.187	ns	-0.287	0.232	0.054	-0.115	0.313	0.268	0.137
Germany	0.145	0.049	-0.219	0.281	0.087	-0.116	0.295	0.223	0.127
France	0.177	0.069	-0.120	0.317	0.065	-0.067	0.296	0.204	0.103
Slovak Republic	0.230	0.069	-0.050	0.306	ns	ns	0.294	0.197	0.086
Belgium (Fr)	0.183	0.031	-0.118	0.313	0.042	-0.049	0.292	0.196	0.094
Hungary	0.116	0.034	ns	0.385	ns	ns	0.324	0.192	0.107
Belgium (Fl) *	0.181	0.047	-0.193	0.269	0.061	0.063	0.255	0.186	0.067
Austria	0.202	0.055	-0.206	0.189	0.032	-0.067	0.288	0.180	0.099
Slovenia *	0.077	0.145	-0.076	0.348	ns	ns	0.312	0.180	0.098
Scotland *	0.169	0.142	-0.087	0.299	0.074	-0.083	0.224	0.175	0.064
Netherlands *	0.173	0.064	-0.182	0.232	0.059	ns	0.299	0.172	0.100
Lithuania	0.061	0.172	-0.045	0.338	0.093	ns	0.238	0.159	0.065
Bulgaria *	0.107	0.121	-0.098	0.287	ns	ns	0.495	0.153	0.246
Norway *	0.112	0.149	-0.157	0.251	ns	-0.052	0.259	0.149	0.073
Spain	0.183	ns	-0.139	0.234	ns	-0.072	0.332	0.148	0.120
England	0.193	0.112	-0.142	0.215	0.075	-0.100	0.240	0.148	0.075
Sweden	0.121	0.138	-0.158	0.223	0.070	-0.090	0.245	0.138	0.079
New Zealand *	0.208	0.145	ns	0.215	ns	-0.086	0.247	0.133	0.064
Iceland	0.186	0.145	-0.115	0.207	ns	-0.049	0.216	0.132	0.049
Latvia	0.079	0.190	0.040	0.265	0.041	0.066	0.179	0.124	0.038
Canada (Q)	0.194	0.112	-0.159	0.175	ns	ns	0.255	0.124	0.065
Poland	0.187	0.106	-0.047	0.219	0.076	ns	0.224	0.117	0.056
Denmark *	0.108	0.103	-0.103	0.239	0.062	-0.099	0.263	0.114	0.089
Canada (NS)	0.186	0.133	ns	0.204	0.059	ns	0.179	0.111	0.036
Italy	0.197	0.039	-0.079	0.155	0.057	-0.071	0.344	0.101	0.134
Canada (O) *	0.171	0.094	ns	0.187	ns	-0.104	0.224	0.096	0.070
Canada (BC) *	0.180	0.060	ns	0.169	ns	-0.169	0.240	0.079	0.096
Canada (A) *	0.156	0.059	-0.048	0.166	0.040	-0.091	0.216	0.072	0.059

All results significant ($p < .05$) (expect ns = not significant).

* For sample characteristics see Martin et al., 2007.