

SELF-CONCEPT IN READING: FACTOR STRUCTURE, CROSS-CULTURAL INVARIANCE AND RELATIONSHIPS WITH READING ACHIEVEMENT (PIRLS 2011)

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Self-concept

- Academic self-concept is a cornerstone motivational construct.
- *“Perception a person has of his/her own ability in a domain”*.
- Desirable outcome itself or a correlate with achievement.
- Including a scale of self-concept in ILSA does not mean that the same construct is captured in different countries, and that comparisons between countries are valid.

Self-concept subcomponents (mixed scale +/- items)

1) From a conceptual point of view

Two factors: “Perception of competence” and “perception of difficulty” (Chapman and Tunmer, 1995).

Perception of difficulty has a higher correlation with reading (Klauda and Guthrie, 2015).

2) From a method point of view

Method effect: in presence of a mixed scale, positive items usually load on one factor and negative items on a second factor (Podsakoff, McKenzie, Lee & Podsakoff, 2003).

Self-concept factor structure: competing views

In presence of two-factor models, different interpretations:

- a) Two “substantive” constructs (such as ‘Perceived competence’ and ‘Perceived difficulty’).
- b) “Ephemeral artifacts due to wording effects that have no substantive relevance”
- c) Method effects linked to the wording reflecting more stable response-styles

(Marsh, Scalas & Nagengast. 2010, p. 367).

ILSA: cross-cultural differences

- In ILSA, Likert scales are often used to measure constructs.
- Response styles biases (acquiescence, ERS, social desirability) linked to Likert scales may jeopardize the validity and cross-cultural equivalence of constructs.

Consequences of response styles in ILSA

- In most of the cases in ILSA, scalar invariance is not achieved => country means on a construct cannot validly be compared.
- **Attitudes-achievement paradox:** correlations at the country-level and within countries go in opposite directions, resulting in paradoxical results.

(Kennedy & Trong, 2006; Kyllonen & Bertling, 2013; Lie & Turmo, 2005; van de Gaer, Grisay, Schulz, & Gebhardt, 2012).

Present investigation: aims and research questions

1. Is a two-factor structure of a “mixed” self-concept scale (positive and negative items) confirmed in an international context?
2. Does the self-concept scale achieve the three levels of cross-cultural equivalence – configural, metric and scalar?
3. How do “perception of competence” (positive items) and “perception of difficulty” (negative items) correlate with reading achievement within countries and at the country level? Is the attitude-achievement paradox observed for both dimensions?

Data

Data from PIRLS 2011 have been used (48 education systems).

IEA-PIRLS is a cyclical international assessment of reading literacy (grade 4).

Data

Measures:

- Self-concept scale: seven items using a four-point Likert scale ranging from “*disagree a lot*” to from “*agree a lot*”, including positively and negatively oriented items.

From a syntactical point of view, the negative items (difficulty) were affirmative (no negation).

- Reading achievement (plausible values).

a) *I usually do well in reading*

b) *Reading is easy for me*

c) *Reading is harder for me than for many of my classmates*

d) ~~*If a book is interesting, I don't care how hard it is to read*~~

e) *I have trouble reading stories with difficult words*

f) *My teacher tells me I am a good reader*

g) *Reading is harder for me than any other subject*

Methods

- Exploratory and confirmatory factorial analyses;
- MGCFA;
- *Within country* correlations and *country level* correlations between the scales of self-concept and reading achievement.

RESULTS

Question 1: EFA

An EFA with oblique rotation was performed in MPlus on the pooled data set and by country.

Two different models have been compared.

- The one-factor model did not show good fit indices (RMSEA = .152; SRMR = .11).
- The two-factor model showed satisfactory fit indices (RMSEA= .020; SRMR= .008).

Question 1: EFA

Table 1

Exploratory Factor Analysis of the Reading Self-concept scale (N = 267717)

Items	Factor	
	1 Competence	2 Difficulty
1. I usually do well in reading.	.72	.00
2. Reading is easy for me.	.63	-.15
3. Reading is harder for me than for many of my classmates.	-.01	.73
5. I have trouble reading stories with difficult words.	.00	.51
6. My teacher tells me I am a good reader.	.55	.06
7. Reading is harder for me than any other subject.	.00	.70

Note. Exploratory factor analysis was conducted with maximum-likelihood estimation and oblique rotation. Low factor loadings (<.35) are in blue

Question 1: CFA

A CFA with maximum likelihood was then performed, using *Mplus*.

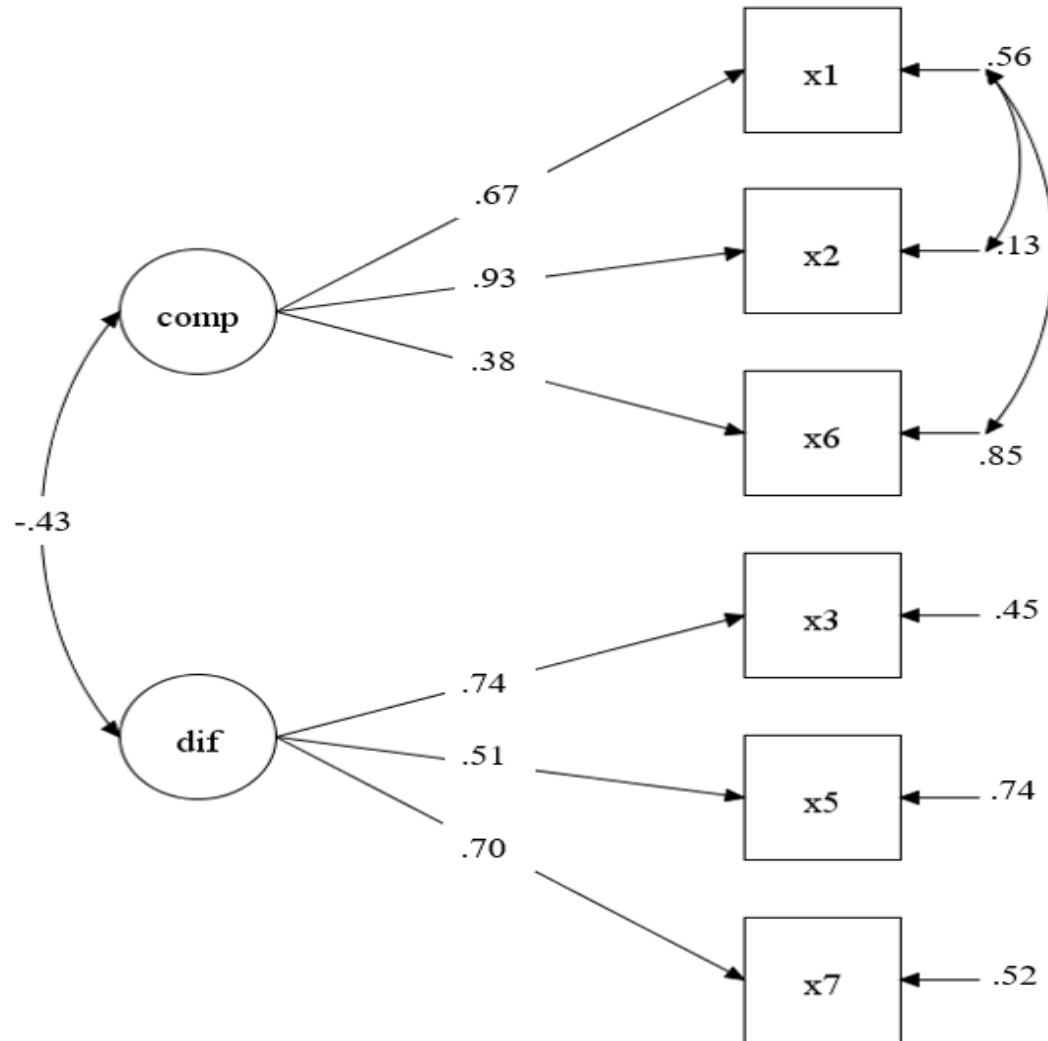
Indices of fit were excellent: $\chi^2_{(6)} = 18.71$ $p = .005$; RMSEA = .003; SRMR = .003; CFI = .99; TLI = .99.

A two-factor model of the reading self-concept showed a better fit with the data than a one-dimensional model.

This is consistent with Chapman and Tunmer (1995), and with Marsh, Scalas, & Nagengast (2010) (Rosenberg self-esteem) .

The two-factor model could also result from a method effect.

Path diagram of CFA representing the two factors structure of the RSC scale



Correlations between self-concept factors

- The correlation between the two factors was $-.43$.
- Variations of the correlations between the two factors were observed between countries: in the majority of countries (33 out of 48), the correlation was robust (above $-.60$); in some countries, such as in Colombia ($-.14$), Honduras ($-.02$) and Indonesia ($-.18$), it was substantially lower.
- All countries in which the correlation between the two factors was weaker were non-Western countries (South America, Africa, South Asia).

Question 2: MGCFA

Table 2

Goodness-of-fit indices for a Multiple Group Confirmatory Factor Analysis Testing Cross-National Invariance

Model	RMSEA	90% CI		CFI	TLI	Δ RMSEA	Δ CFI	Δ TLI
Configural invariance	.048	.047	.050	.975	.954			
Metric invariance	.054	.054	.055	.954	.942	.006	.021	.012
Scalar invariance	.093	.092	.094	.798	.830	.039	.156	.144

Note: RMSEA = Root Mean Square Error of Approximation; 90%CI Confidence Interval; CFI = Comparative Fit Index; TLI = Tucker–Lewis

Step 2: MGCFA

- Configural and metric invariance were achieved => similar structure across countries and factors can validly be correlated with other variables.
- Scalar invariance was not achieved => factor means should not be compared across countries.

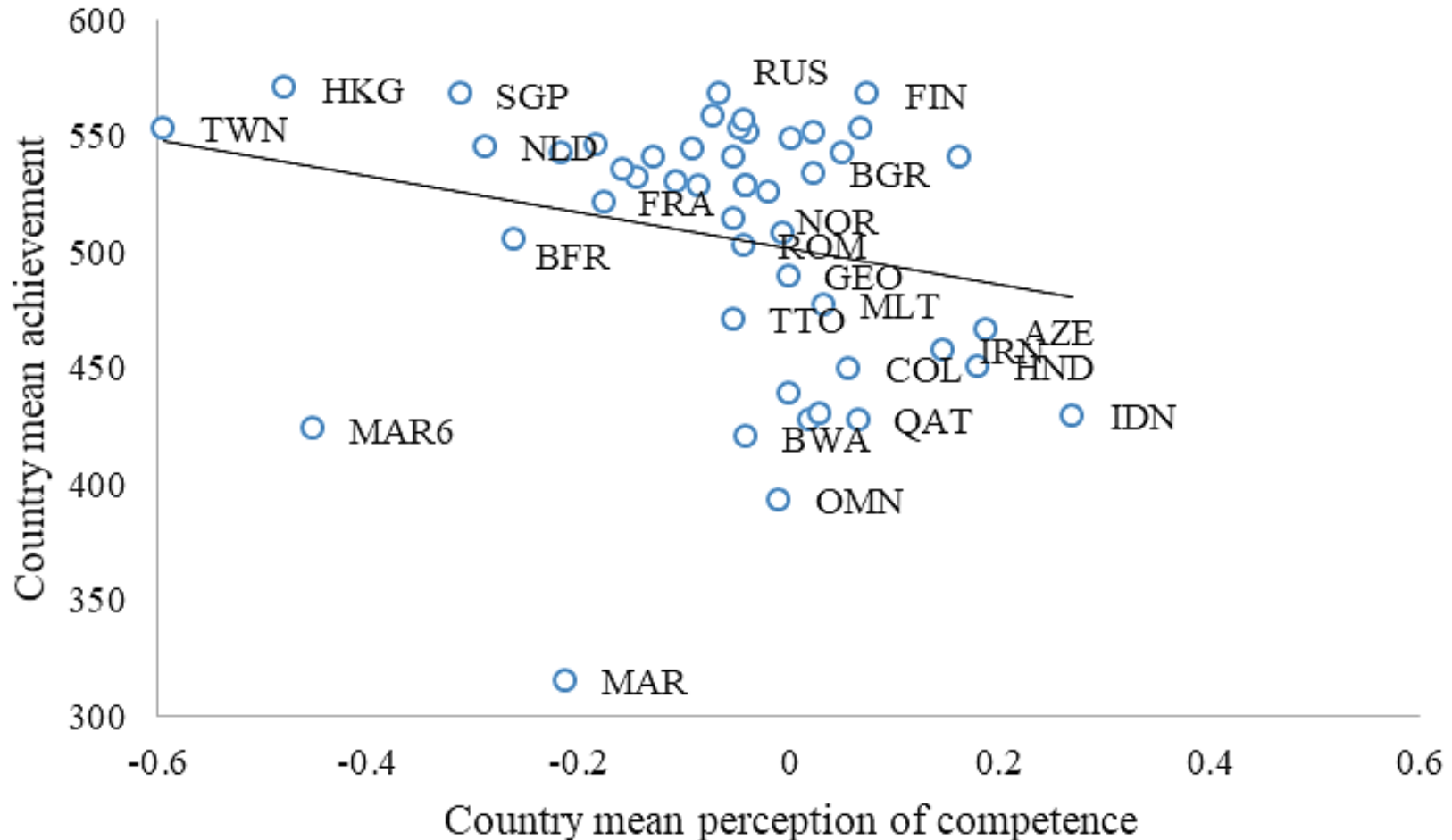
“it is uncommon to find support for scalar invariance in studies involving huge samples in many countries because the invariance tests are sensitive to sample size”

(Van de Vijver & He, 2014, p. 17).

Question 3: *within country* correlations between the two SC factors and reading

- In every country except Honduras, *Perception of competence/positive items* was positively related with reading achievement (0.42 on average).
- In all countries, *Perception of difficulty/negative items* was negatively related with reading achievement (- 0.55 on average).
- Results are consistent with numerous cross-sectional or longitudinal studies about self-concept in reading (Bong, 1998; Chapman, Tunmer & Prochnow, 2000; Morgan & Fuchs, 2007; Park, 2011; Retelsdorf, Köller & Möller, 2014).
- In addition, in all countries without exception, the correlations of reading achievement with *Perception of difficulty* were more robust than those with *Perception of competence*.
- This result is consistent with the study of Chapman and Tunmer (1995) and Klauda & Guthrie (2015).

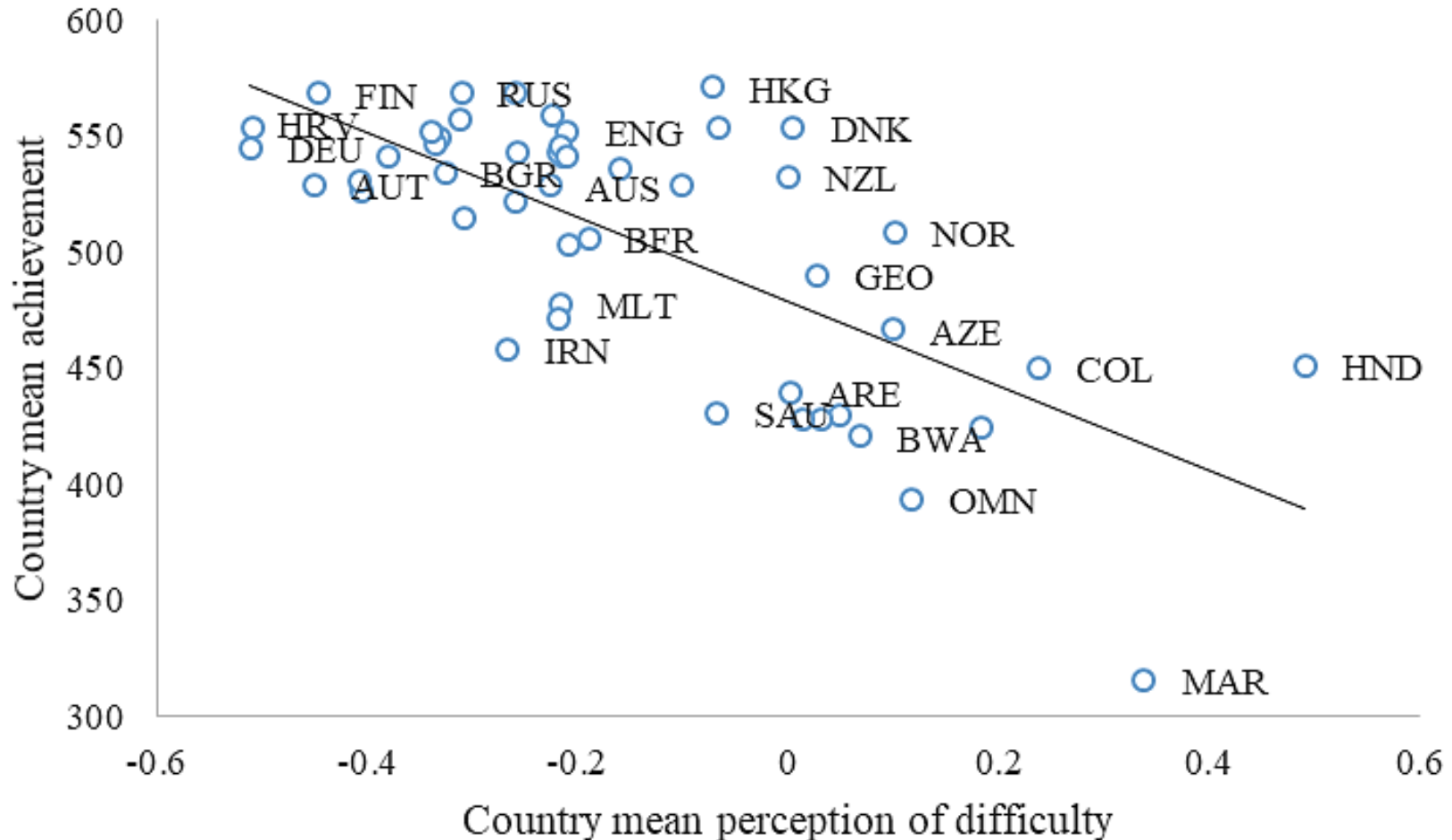
Question 3: *country level* correlations between perception of competence and reading



Correlations with reading at the country level

- The *Perception of competence* was negatively correlated with the country average of reading achievement (- 0.29).
- In higher-performing countries, students perceived themselves as less competent than in low-performing countries.
- This is typical of the attitude-achievement paradox (Kyllonen & Bertling, 2013; Lie & Turmo, 2005; Lu & Bolt, 2015; Van de Gaer, Grisay, Schulz & Gebhardt, 2012).

Question 3: *country level* correlations between perception of difficulty and reading



Correlations with reading at the country level

- The *Perception of difficulty* was strongly and negatively (-.70) related to reading achievement at the country level: students reported more difficulty in low-performing countries (Colombia, Honduras, Morocco had the highest scores) than in high performing countries

=> no attitude-achievement paradox for the negative side of self-concept.

- Less prone to response-styles? No reason to overclaim having difficulties, less social desirability, less reason to be modest...?

Limitations and perspectives

- With the simple approach used, it was not possible to disentangle the conceptual (trait) difference from the method.
- It is well-known that there is a method effect with scales mixing positive and negative items.
- In the PIRLS 2011 scale, there was more than + and – orientation/wording: positive items were more general, negative ones were more precise, closer to self-efficacy.
- The fact that the correlations of the two-factors with reading achievement were different and that AA paradox was not observed for the *Perception of difficulty*/negative items is an indication that there was something more than a method effect.

Limitations and perspectives

- For future studies, in order to disentangle trait from method, a more sophisticated approach such as a “methodological-substantive synergy” strategy (Marsh, Scalas & Nagengast, 2010)/multimethod multitrait should be used.

Practical implications

Mixing or not positive and negative items in ILSA?

Competing views:

1. Some argue that it potentially decreases response-styles.
2. Others highlight the method effect issue, especially the ones viewing it as « ephemeral artifacts ». Marsh, Scalas & Nagengast (2010) using longitudinal data and two different multimethod multitrait approaches have shown that the method effect was stable overtime (=> response-styles > artifact).

Limitations and perspectives

- Recommendations against mixed scales = avoid use of negative items.
- But in an international context, negative items of the self-concept scale seemed to work better (higher correlations and no AA paradox).

