The big-fish-little-pond effect on academic self-concept: a comparison of GAPIM and a latent-manifest contextual model

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The Big-Fish-Little-Pond Effect on Academic Self-Concept:
A Comparison of GAPIM and a Latent-Manifest Contextual Model

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PAPER DISCUSSION SYMPOSIUM: THE GROUP ACTOR-PARTNER INTERDEPENDENCE MODEL: A NEW METHOD FOR THE ANALYSIS OF GROUP COMPOSITION EFFECTS IN ADOLESCENCE

Effects of Classroom Likeability Composition on Adolescence Loneliness
Rob Gommans (Utrecht University & Radboud University, NL), Gerine M. A. Lodder (University of Groningen, NL), & Toon H. N. Cillessen (Radboud University, NL)

Group Composition Effects on Observed Behavior of Popular and Unpopular Adolescents
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The Big-Fish-Little-Pond Effect on Academic Self-Concept: A Comparison of GAPIM and a Latent-Manifest Contextual Model
Carmen L. A. Zurbriggen (University of Fribourg, CH), Rob Gommans, & Martin Venetz (University of Applied Sciences of Special Needs Education Zurich, CH)

Discussant: *William J. Burk (Radboud University, NL)*

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„The aphorism ‘It is better to be a big frog in a small pond than a small frog in a big pond’ is not perfect advice, but it is not trivial. …
The theme of the data reported here is that the ‘feeling of success’ is a crucial ingredient in career choice” (Davis, 1966, p. 31).

The Big-Fish-Little-Pond Effect (BFLPE)

- Davis' frog pond effect refers to career aspirations of college men
- "BFLPE of school average ability [achievement] negatively affects academic self-concept" (Marsh, 1987, p. 290; cf. previous findings from Marsh & Parker, 1984)
- BFLPE has been replicated in numerous studies, across diverse levels of education, and different cultures (for reviews see e.g., Marsh & Hau, 2003; Seaton, Craven, & Marsh, 2008; Wang, 2015)
- recent studies provide evidence for the local dominance effect → academic self-concept is largely determined by social comparisons within a class (Huguet, Marsh, Wheeler, Seaton, Dumas, Régner, … Nezlek, 2009; Marsh, Kuyper, Morin, Parker, & Seaton, 2014)

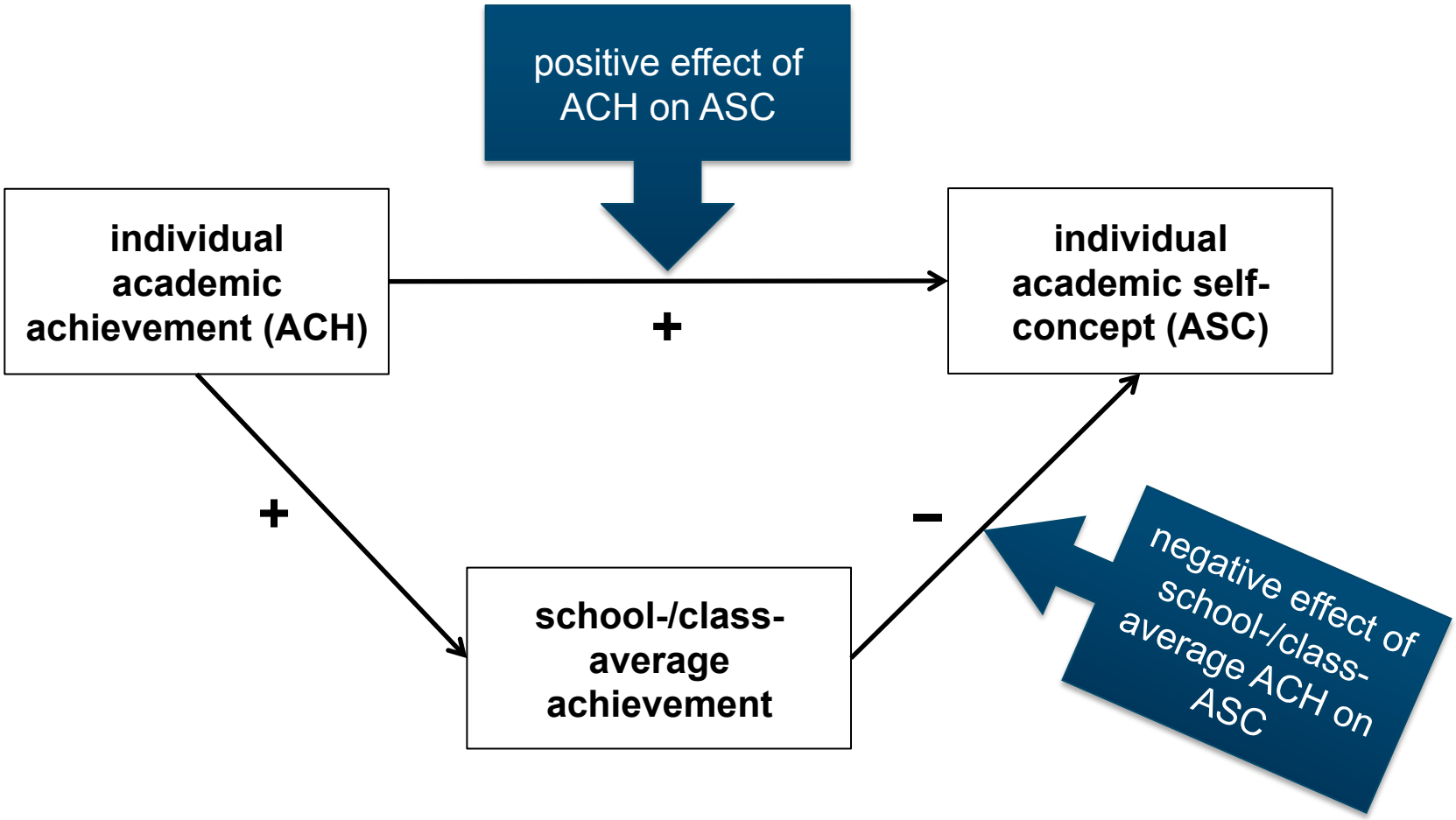

Figure 1. The big-fish-little-pond effect (BFLPE) – theoretical predictions (Marsh, 2005)

BFLPE as contextual effect

- contextual effects → effects of group-level characteristics on outcomes beyond what can be explained by individual-level characteristics
  (e.g. Marsh, Lüdtke, Robitzsch, Trautwein, Asparouhov, Muthén, & Nagengast, 2009)
- class-average achievement as a formative group-level construct
  (cf. Kline, 2011; Lüdtke, Marsh, Robitzsch, Trautwein, Asparouhov, & Muthén, 2008; Müller & Zurbriggen, in press)
  - → based on formative aggregation of individual characteristics
  - → individual scores within a group are not interchangeable
  - → corresponds to a finite sampling process
  - → variance between individuals represents an important classroom characteristic

Modeling contextual effects

- multilevel latent models of contextual effects (Marsh et al., 2009; Lüdtke, Marsh, Robitzsch, & Trautwein, 2011)
- group-level construct in the contextual model → average score of all students in the class
- group-mean centering (e.g. Enders & Tofighi, 2007; Hox, 2010; Kraft, De Leeuw, & Aiken, 1995)
  - → centering within group, i.e. group mean is subtracted from the individual score
  - → recommend in the case of within-group effects
  - → to disentangle conflation of individual-level and group-level effect
- contextual effect with group-mean centering → difference between group-level effect and individual-level effect (e.g. Marsh et al., 2012)

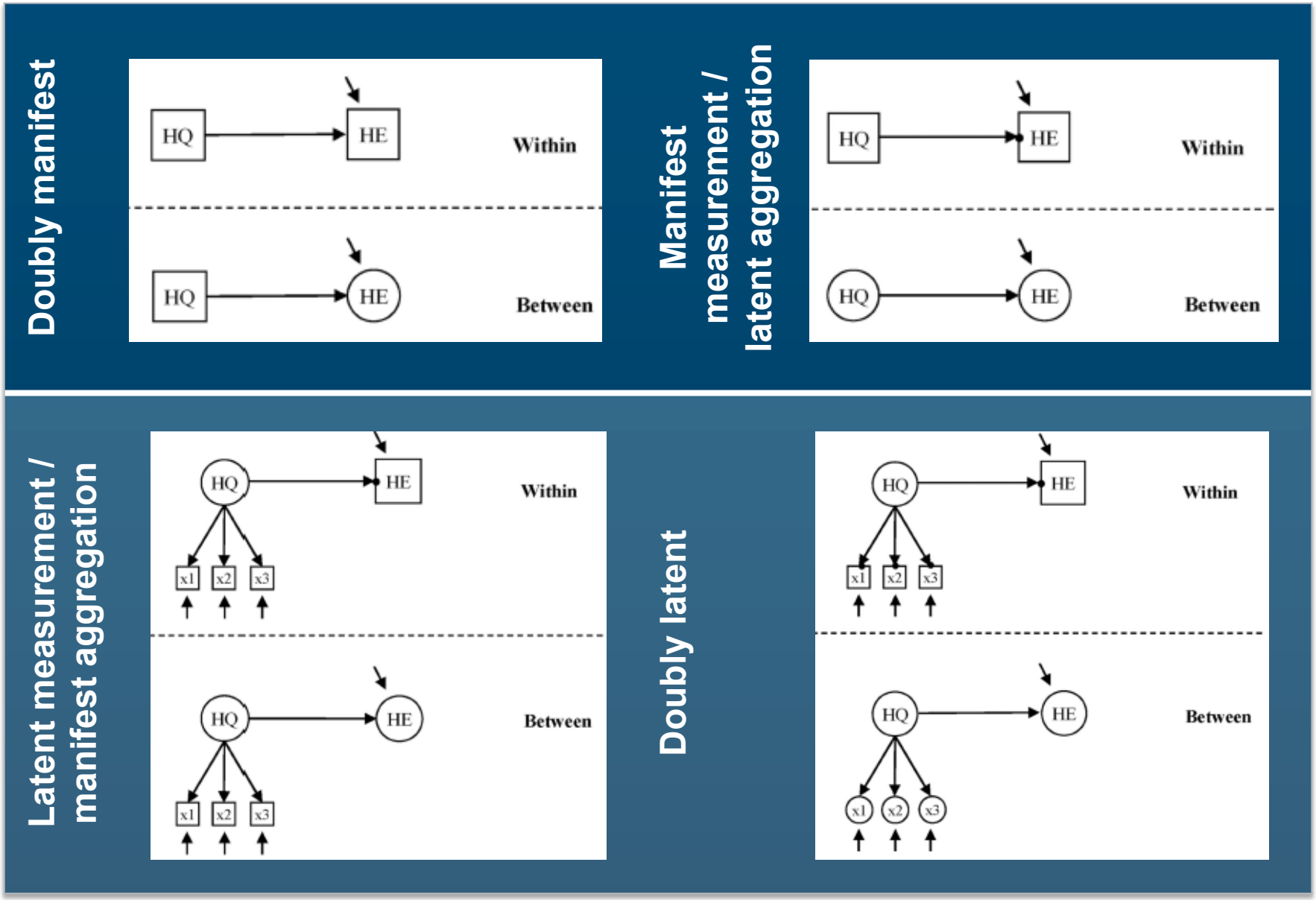

Figure 2. 2 x 2 taxonomy of multilevel latent contextual models (Lüdtke et al., 2011. p. 451)

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GOAL

Comparison of the latent-manifest contextual model and GAPIM using the classical big-fish-little-pond effect (BFLPE) as an example

RESEARCH QUESTION

Is the BFLPE comparable when using either the latent-manifest contextual model or the GAPIM?

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Sample statistics

N = 598 students (German-speaking part of Switzerland)

- age: *M* = 12.2 years, *SD* = 0.8
- female: 288 (48.2%), male: 310 (51.8%)
- 5th primary: 54 (9.0%), 6th primary: 544 (91.0%)
- German as a first language: 372 (63.7%), German as a second language: 99 (17.0%), German and other language: 113 (19.3%)

N = 40 school classes

- number of students per class: *M* = 17.6, *SD* = 5.6
- proportion of girls per class: *M* = 48%, min = 10%, max = 100%
- proportion of students with German as a first language: *M* = 64%, min = 29%, max = 100%

Table 1.
Constructs and measurement instruments

Academic achievement	achievement tests *Klassencockpit* in mathematics and German as language of instruction (z-standardised values)
Academic self-concept	Scale *Academic self-concept* [*kompetenzbezogene Integration*] from Venetz, Zurbriggen, and Eckhart (2014; short version of the FDI from Haeberlin, Moser, Bless, & Klaghofer, 1989) Items: 4 point Likert scale *I do well in my schoolwork.* *I am a fast learner.* *I am able to solve very difficult exercises.* *Many things at shool are too difficult for me. (−)* Reliability: ω = .81 ($VI_{90\%}$: .78/.83); Cronbachs *α* = .80

Variance components of academic achievement and academic self-concept

Table 2.
Variance within and between school classes and intraclass correlation coefficients ICC(1)

	academic achievement	German achievement	math achievement	academic self-concept
variance within school classes	0.902	0.565	0.864	0.357
variance between school classes	0.111	0.066	0.077	0.001
ICC(1)	0.110	0.105	0.081	0.004

Note. ICC(1): Proportions of the between-group variance to the total variance.

Intraclass correlations coefficient ICC(1)

Random-coefficient model

(e.g. Bryk & Raudenbush, 1992)

$$ICC(1) = \frac{\sigma_T^2}{\sigma_T^2 + \sigma_e^2}$$

$ICC(1) = 0.004$

One-way random-effects ANOVA model (Bartko, 1976)

$$ICC(1) = \frac{MSB - MSW}{MSB + \left[(k-1) * MSW\right]}$$

$ICC(1) = -0.025$

within-group effect
or frog-pond effect

(e.g. Bliese, 1998; 2000; Dansereau, Alutto, & Yammarino, 1984; Yammarino & Dansereau, 2009)

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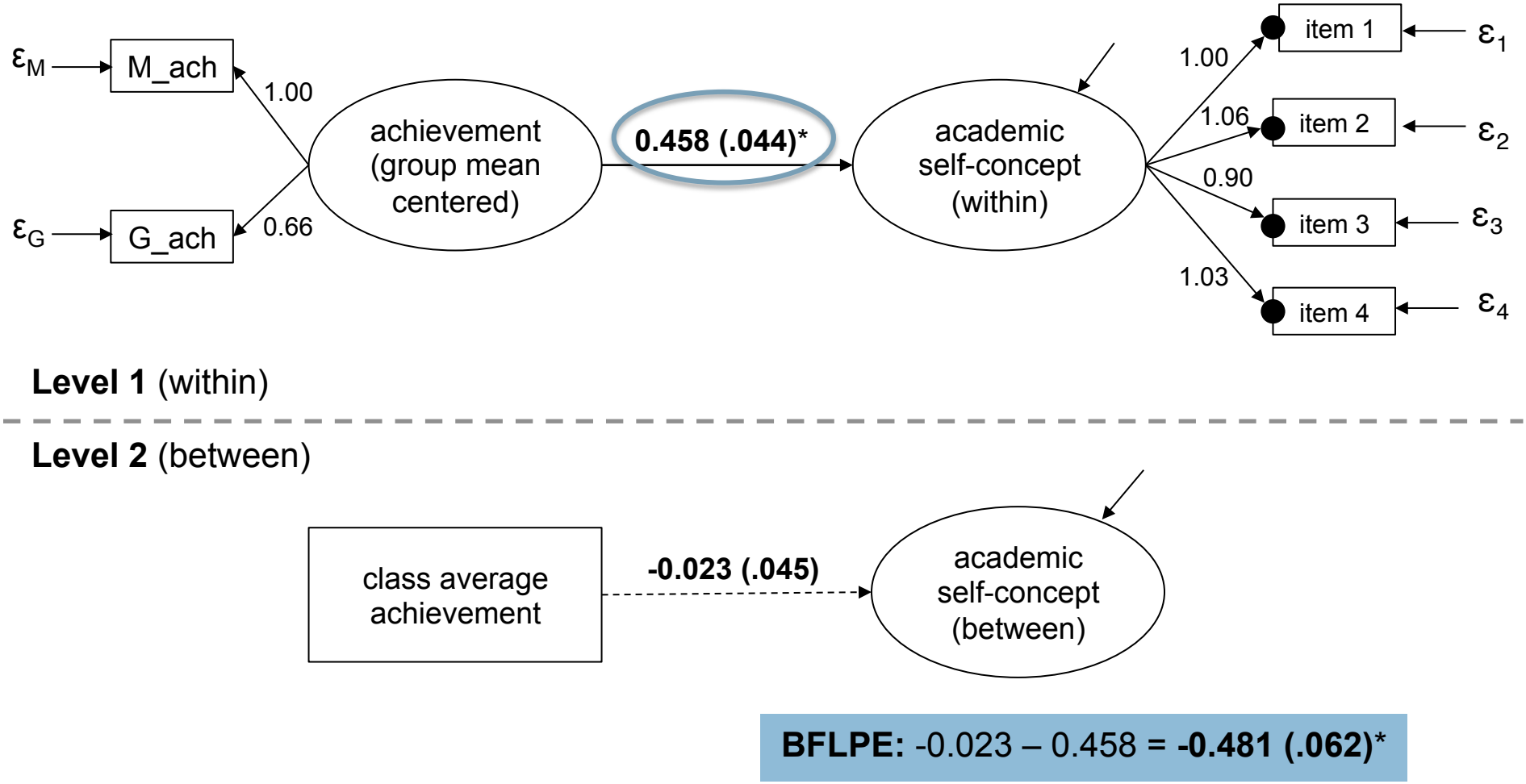

Figure 3. BFLPE model with latent variables on level 1 and manifest aggregation on level 2, reported are unstandardized coefficients (model specification see Marsh et al., 2009).
Notes. M_ach: Math achievement, G_ach: German (language of instruction) achievement. AIC = 6880.678, BIC = 6972.697, SABIC = 6906.028. *: $p < .001$.

Results: GAPIM

Table 2.
Group composition effect estimates of observed academic achievement on latent academic self-concept using the GAPIM

Model	Main effects		Similarity effects		Fit	
	Actor ACH	Others ACH	Actor similarity	Others similarity	SABIC	R^2_{within}
Empty	0[a]	0[a]	0[a]	0[a]	4575.900	.000
Main effects only	0.428* (.039)	-0.413* (.054)	0[a]	0[a]	4367.826	.395 (.057)
complete	0.428* (.037)	-0.424* (.051)	-0.132 (.096)	0.205 (.213)	4370.069	.400 (.051)
contrast	0.437*[b] (.037)	-0.437*[b] (.037)	-0.132 (.096)	0.206 (.213)	4366.956	.400 (.051)

Notes. $*p < .001$. SABIC: Sample-size-adjusted Bayesian Information Criterion.
[a] Constrained to zero.
[b] Constrained to be equal, but with opposite signs.

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1 THE BIG-FISH-LITTLE-POND EFFECT

2 THE PRESENT INVESTIGATION

3 METHODS

4 RESULTS

5 DISCUSSION

Comparison of the BFLPE: Methodological considerations

Contextual model

BFLPE = − 0.481 (.062)*

- average achievement of all students in the class
- predictor and outcome as latent variables (on individual level)
- model-based handling of missing data (FIML)
- differences between classes taken into account

GAPIM

BFLPE = − 0.437 (.037)*

- average achievement of all other students in the class
- only outcome as latent variable
- listwise deletion of missing values (alternative: imputation)
- differences between classes not taken into account

Comparison of the BFLPE: Content-related considerations

- Both methods for the analysis of group composition effects supported the BFLPE.
- To some extent, however, the two methods provide different pieces of information:
  - In the GAPIM approach, the actor effect and the effect of others in the class can be compared directly.
  - In the latent-manifest contextual model approach, effects between classes are also considered.
- In the GAPIM, several different effects of group composition can be tested simultaneously (e.g. Garcia, Meagher, & Kenny, 2014; Kenny & Garcia, 2012)

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