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Attenuating the school context increases students' academic self-concept

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Abstract

Big-Fish-Little-Pond (BFLP) theory posits that being surrounded by high-ability peers reduces students' self-perceived ability – i.e., their academic self-concept (ASC), which is known to regulate the effort students put into education. We add to this literature the finding that the school context alone, without referring to peers' ability, triggers social comparison and can decrease students' ASC. We hypothesize that attenuating the school context increases students' ASC. The paper shows two examples of how attenuating school context leads to an increase in ASC. In Study 1, we exploited COVID-19-induced home-based education where students learned online without their usual school context. We find that students' ASC in reading and writing increased outside the school context. In the randomized survey experiment of Study 2, we treated students by asking first for their ASC and subsequently their grades – thus, we attenuated the school context by ordering the questions. We asked control students first about their grades and subsequently their ASC. We found that treated students' ASC increased in reading (but not in writing) compared to the control students who first reported their grades and then their ASC. The results indicate that the school context alone renders the perception of ability relative to peers, which triggers an unintended negative effect on students' ASC.

Keywords: Academic self-concept; Social comparison; Randomized experiment
JEL Classification Codes: C93, D91, I24

1. Introduction

Academic self-concept (ASC) is a well-established educational psychology concept that describes people's perception of their abilities (Shavelson et al., 1976). ASC evokes research in economics since it influences educational attainment and achievement (Chevalier et al., 2009). Students put effort into those subjects in which they perceive themselves as talented (Azmat & Iriberri, 2010; Elsner & Isphording, 2017).

ASC is formed through external and internal comparison (Marsh, 1986). External comparison is when students compare their ability to peers' perceived ability. Internal comparison means

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when students compare their perceived ability in one academic domain to their perceived ability in another. External comparison is the primary influence on students' ASC (Marsh & Craven, 1996), highlighting the validity of social comparison theory (Festinger, 1954) concerning the basic human drive to evaluate one's own abilities relative to peers' ability.

One of the most prestigious theories that expand the external social comparison process is Big-Fish-Little-Pond (BFLP) theory (Marsh & Parker, 1984). The theory suggests that equally able students' ASC decreases when higher-ability students surround them and increases among lower-ability students. The BFLP effect is empirically operationalized by peers' average ability (Marsh et al., 2008).

Various observational studies demonstrate that school/class average ability negatively affects students' ASC (see Fang et al., 2018, for a meta-analysis). These findings suggest that students acquire higher ASC among peers with weaker academic achievement, although such a context negatively affects students' academic ability.

Critical interpretation of the BFLP literature points out that the BFLP effect is situationally imposed, i.e., it is not an active comparison process that is self-engendered by individuals who actively choose the specific target person to whom they compare their abilities. Thus, the non-agent-based feature of the BFLP effect conveys a mechanistic flavor to the BFLP effect and disproportionately emphasizes one specific aspect of social comparison (Dai & Rinn, 2008).

This paper goes behind Dai & Rinn's (2008) critical interpretation of the BFLP effect. If the BFLP effect is situationally imposed and mechanistic, then simply alluding to the school context – without specifically referring to peers' average ability – will activate the BFLP effect.

We hypothesize an increase in students' ASC if the school context is attenuated; thus the otherwise negative effect of school context on students' ASC is weakened. We rely on experimental data (natural and randomized) and observe how the *absence* of school context affects students' ASC.

In Study 1, we exploited the COVID-19-induced home-based online education that detached students from their usual school context since students learned at home outside the school context. We scrutinized how students' ASC is affected by the absence of daily contact with peers. We find that students' comparative ASC in reading and writing increased during this period. However, Study 1 was unable to isolate the effect of confounders that might influence students' ASC during COVID-19-induced home-based online education.

Therefore, we turned to a subsequent randomized survey experiment (Study 2), which corroborated the suggestive evidence of Study 1. In Study 2, we activated/attenuated the school context by priming; i.e., by prompting students to anchor their self-concept to their grades (Cohn & Maréchal, 2016). We designed a survey experiment in which treated students reported first their ASC and then responded to a retrospective question about grades. Thus we attenuated the school context by inquiring into students' ASC without priming to link it to actual school performance. By contrast, in the control group, we first induced the school context by asking for students' grades, followed by the ASC question. We find that treated students perceived their comparative ASC in reading (but not in writing) to be higher relative to that of control students.

In sum, our findings indicate that the pure school context (without peers' actual ability) involuntarily decreases students' ASC. Thus, it is merely the school context that triggers the interpretation of own ability relative to peers' ability, which renders an unintended negative effect on students' self-evaluations. Practitioners should, therefore, purposefully mitigate this adverse effect by fostering students' educational attainment and achievement.

2. Participating schools

Schools participating in Study 1 and Study 2 are a not random sample of Hungarian public primary schools. These schools are located in the rural countryside of the northern and central

parts of the country. Primary education in Hungary encompasses the primary and lower-secondary ISCED 1 and ISCED 2 levels.

Schools are identical in the two studies, and the participating students were the same. However, in Study 2 the schools are a subset of schools in Study 1. Compared to Study 1, Study 2 was organized half a year later, in the subsequent academic year. Thus compared to Study 1, the same students in Study 2 were attending the subsequent grade.

We can compare sixth-grade students in our two studies to the sixth-graders in nationwide administrative data at the school-level. Based on this school-level but not student-level matching, participating schools in both studies performed below the national average in terms of students' ability and parental background, as Table 1 summarizes.

Table 1. School average statistics about the participating schools: national average and average of schools involved in Study 1 and Study 2, respectively – National school-level administrative data concerning the sixth-grader cohort in 2017, school-level matching.

	Math test	*Reading test*	*Mother has a college degree*	*Mother works*	*Father has a college degree*	*Father works*
NABC-sixth-graders, national average*	0.00	0.00	0.31	0.78	0.23	0.87
Sixth-graders in schools of Study 1	-0.24	-0.25	0.21	0.76	0.15	0.86
Sixth-graders in schools of Study 2	-0.24	-0.29	0.16	0.73	0.11	0.85

Notes: NABC (National Assessment of Basic Competences) contains the sixth-grader cohort in the year 2017. NABC 2017 is the latest publically available NABC data set. NABC-sixth-graders are not identical to those sixth-graders analyzed in Study 1 or 2.

3. Measurement

In both studies, we focused on students' comparative academic self-concept [CASC] (Wigfield & Eccles, 2000), deploying a battery of subject-specific questions proposed by Eccles et al. (1993). We restricted our analysis to verbal skills since these are more obvious to peers and are claimed to be influenced more in social comparison (Fang et al., 2018).

We asked the following subject-specific question for reading (Hungarian literature) and writing (Hungarian grammar): "Compared to your classmates, how good are you at [subject]?", coded from 1 ("In the class, I am among the worst at [subject]") via 4 ("In the class, I am average at [subject]") to 7 ("In the class, I am among the best at [subject]").

The data and analysis scripts are available at the OSF platform: https://osf.io/m3kyv/ for both studies.

4. Study 1

In Study 1 we exploited COVID-19-induced mandatory home-based education. Here, teachers taught students outside the usual classroom environment via online means. We collected our data in Spring 2020 (academic year 2019/20) from about 951 Hungarian primary school students enrolled in 28 rural Hungarian primary schools and 126 classrooms in grade levels 4 to 8.

We organized two consecutive waves (W1 and W2) of an online survey. We conducted W1 at the beginning of the home-based education period, followed by W2 on average 32 days later. Students completed the questionnaire at home in an unsupervised environment. Participation was voluntary, and the average class-wide response rate was 60%.

We analyzed the change in students' subject-specific CASC by fitting the following student-fixed effect difference-in-differences model to the pooled data of W1 and W2.

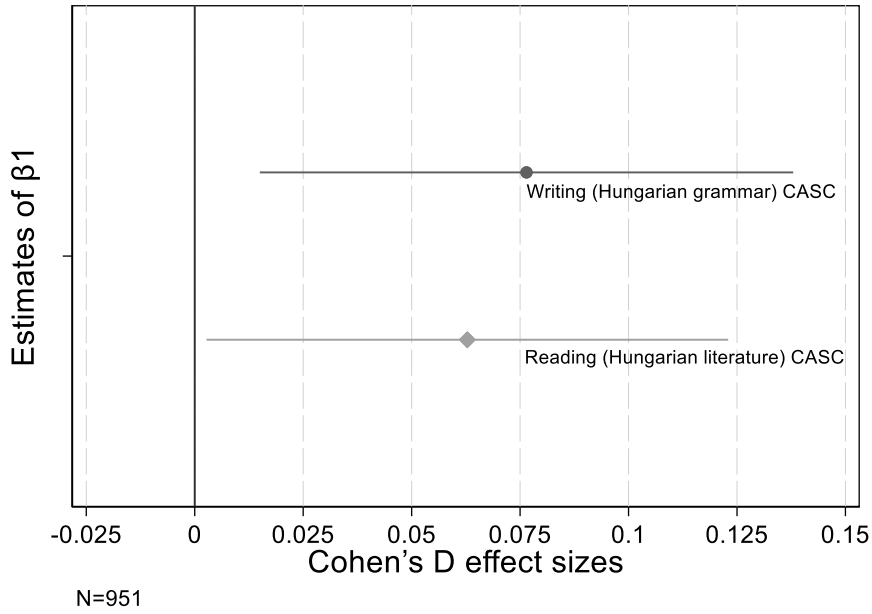
$$CASC_{ics} = \alpha + \beta_1 W2_{ics} + \eta_{ics} + e_{ics} \quad (1)$$

In *Eq.1.*, $CASC_{ics}$ stands for the *i-th* students' subject-specific CASC in classroom *c* and school *s* obtained from the first/second wave of the survey. $W2_{ics}$ is a dummy variable indicating students' answers in the second wave of the survey [=1]. We controlled for all student-level unobserved confounding by deploying student fixed-effects (η_{ics}). e_{ics} represents the individual error terms. Standard errors are clustered at the classroom level.

We hypothesized a positive β_1, meaning that students' CASC increases during home-based online education, which detached students from their usual school context and attenuated the automatic environmental pressure that harms ASC.

Figure 1 shows the estimates for β_1 concerning grammar/literature CASC, respectively. The results confirm our hypothesis. We received positive coefficients for both dependent variables. The estimated effect sizes indicate a small effect (6-7% of the dependent variables' standard deviation). Since unobserved and uncontrolled confounders might influence students' ASC between W1 and W2, we interpret the finding as suggestive evidence that needs further experimental confirmation, which we perform in Study 2.

Figure 1. Cohen's D effect sizes for change in writing (Hungarian grammar) and reading (Hungarian literature) CASC in Study 1.



5. Study 2

In Autumn 2020 (academic year 2020/21), we conducted a randomized survey experiment in the schools of Study 1. Study 2 involved 1,308 students (between grades 5 and 8) from 82 classrooms and 19 schools who participated in the online survey. Students completed the survey in schools with their classmates, supervised by their teachers. The average class-wide response rate was 87%.

We randomized individual students to treated and control conditions based on the value of a random number. Half of the students were assigned to the treated and the remaining half to the control condition. Students assigned to treated/control conditions are well balanced in their baseline variables. The gender, age, and students' baseline school grades do not differ at a 5% level of significance between the treated and the control group (see Table A1 in Appendix).

The treatment consisted of altering the sequence of questions in the questionnaire. In the treatment group, we first asked the subject-specific self-concept questions followed by a retrospective question about students' grades in the last semester. By asking for students' self-

concept before their grades, we attenuated the school context. In the control condition, we first asked for students' grades, followed by the subject-specific self-concept questions. By asking for students' grades before the self-concept questions, we induced the school context.

We hypothesized that students estimate their subject-specific CASC as higher in the treated group in which the school context was attenuated than in the control group in which the school context was activated.

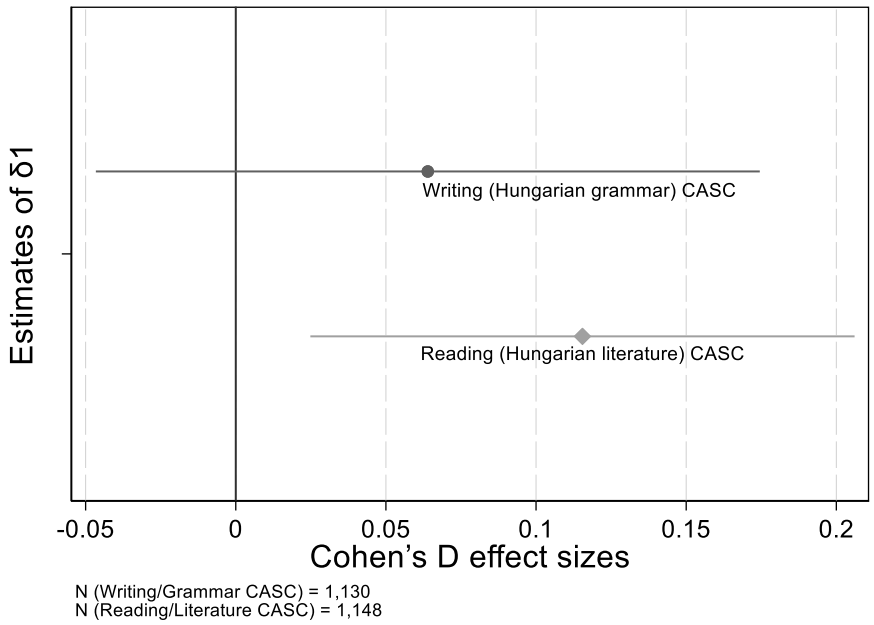
We tested this hypothesis by employing the following classroom fixed-effect OLS model:

$$CASC_{ics} = \alpha + \delta_1 T_{ics} + \delta_2 X_{ics} + \theta_{cs} + e_{ics} \quad (2)$$

In *Eq.2.* $CASC_{ics}$ stands for the *i-th* students' subject-specific CASC in classroom *c* and school *s*. T_{ics} is a dummy variable indicating treated students [=1] and X_{ics} stands for students' baseline variables (gender, age, and the corresponding subject-specific baseline grades). We controlled for all classroom-level unobserved confounding by deploying student fixed-effects (θ_{cs}). e_{ics} represents the individual error terms. Standard errors are clustered at the school level. The coefficient of interest is δ_1, which shows the difference in treated versus contol students' ASC.

Figure 2 shows the estimates for δ_1 concerning grammar/literature CASC, respectively. Since we received positive coefficients for literature but not for grammar, our hypothesis is partly confirmed. The estimated effect size for literature CASC shows the small effect of our light-touch treatment, equivalent to 11% of the standard deviation.

Figure 2. Cohen's D effect sizes between treated and control students' CASC in writing (Hungarian grammar) and reading (Hungarian literature) in Study 2.



The heterogeneity analysis concerning ASC in Literature (Table 2) shows that the treatment effect concentrates mainly among female students (Column 2), students in lower grades (Column 4), and students with average and weak grades in Literature (Column 6).[1] Treatment heterogeneity according to baseline grades corroborates the theoretical assumptions of BFLP. Specifically, attenuating the school context increased those students' ASC who had lower school grades, indicating that their ability is inferior to peers' ability. No heterogeneous treatment effect was explored in Grammar CASC (Table 3).

[1] Grades are integers between 1 and 5, where larger numbers signal better achievement. Weak/average performance are denoted by grades 1, 2, and 3, and good/excellent performance by grades 4 and 5.

Table 2. Estimated results for CASC in reading (Hungarian literature) for the whole sample and various subsamples, unstandardized OLS regression coefficients.

	(1) Whole sample	(2) Female	(3) Males	(4) Grades 5&6	(5) Grades 7&8	(6) Literature grade: average/ weak	(7) Literature grade: good/ excellent
Treatment	0.164*	0.268**	0.082	0.188+	0.141	0.255**	0.058
	(0.061)	(0.091)	(0.106)	(0.094)	(0.103)	(0.085)	(0.091)
Female	-0.003			0.058	-0.065	0.109	-0.105
	(0.031)			(0.100)	(0.099)	(0.109)	(0.063)
Age	-0.077	0.012	-0.105	0.033	-0.195+	-0.146+	-0.076
	(0.070)	(0.128)	(0.111)	(0.113)	(0.100)	(0.082)	(0.115)
Literature/ reading grade	0.881**	0.812**	0.917**	1.002**	0.808**	0.590**	1.253**
	(0.038)	(0.068)	(0.037)	(0.072)	(0.053)	(0.125)	(0.092)
Constant	2.176*	1.220	2.459	0.149	4.283**	3.884**	0.513
	(0.915)	(1.766)	(1.468)	(1.390)	(1.383)	(1.280)	(1.624)
Observations	1,148	528	620	552	596	472	676
R-squared	0.452	0.506	0.504	0.446	0.472	0.266	0.360
Treatment' Cohen's D	0.114	0.193	0.056	0.128	0.100	0.219	0.045

Notes: All models include classroom fixed-effects. Standard errors are clustered at school-level. Robust standard errors in parentheses. ** p<0.01, * p<0.05, + p<0.1

Table 3. Estimated results for CASC in writing (Hungarian grammar) for the whole sample and various subsamples, unstandardized OLS regression coefficients.

	(1) Whole sample	(2) Female	(3) Males	(4) Grades 5&6	(5) Grades 7&8	(6) Grammar grade: average/ weak	(7) Grammar grade: good/ excellent
Treatment	0.093	0.157+	0.053	0.177	0.023	0.159	-0.009
	(0.077)	(0.088)	(0.121)	(0.104)	(0.111)	(0.145)	(0.089)
Female	0.079			0.124	0.020	0.135	0.015
	(0.064)			(0.098)	(0.120)	(0.109)	(0.090)
Age	-0.146+	-0.151	-0.119	-0.211	-0.087	-0.167	-0.222
	(0.082)	(0.116)	(0.119)	(0.131)	(0.086)	(0.110)	(0.141)
Grammar/ wrinting grade	1.006**	0.982**	1.027**	0.934**	1.086**	0.725**	1.136**
	(0.049)	(0.096)	(0.044)	(0.093)	(0.047)	(0.098)	(0.079)
Constant	2.567*	2.745	2.184	3.303+	1.758	3.620*	3.028
	(1.164)	(1.623)	(1.631)	(1.769)	(1.267)	(1.682)	(1.986)
Observations	1,130	519	611	542	588	465	665
R-squared	0.519	0.545	0.561	0.469	0.574	0.355	0.453
Treatment' Cohen's D	0.063	0.111	0.036	0.119	0.016	0.132	-0.006

Notes: All models include classroom fixed-effects. Standard errors are clustered at school-level. Robust standard errors in parentheses. ** p<0.01, * p<0.05, + p<0.1

6. General discussion

In this paper, we hypothesized that attenuating the school context increases students' ASC. We relied on a natural experiment and a survey experiment.

We exploited COVID-19-induced home-based education in the natural experiment when students were taught outside their usual school context. By comparing students' ASC at the beginning/end of the home-based education, we found that students' ASC increased in reading

and writing during the home-based education. Still, uncontrolled confounders might bias these results.

The randomized survey experiment attenuated/activated the school context by asking the ASC questions before/after collecting students' self-reported school grades. The results partially supported our hypothesis: attenuating the school context translated into an increase in students' reading ASC but did not influence the writing ASC.

Our results have implications for teachers. If the perception of students' own abilities in the school context shrinks students' ASC, teachers should identify means of counterbalancing this adverse effect. Otherwise, students might put less effort into subjects at which they perceive themselves as less competent.

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Appendix – Additional tables

Table A1. Balance test on the baseline variables for the sample of those students included in the Grammar model in Figure 2.

	(1) Grammar grade	(2) Literature grade	(3) Math grade	(4) GPA	(5) Female	(6) Age
Treated	-0.084	-0.017	-0.040	-0.046	-0.012	-0.033
	(0.071)	(0.059)	(0.064)	(0.061)	(0.024)	(0.036)
Constant	3.574**	3.699**	3.520**	3.598**	0.466**	12.176**
	(0.032)	(0.027)	(0.029)	(0.028)	(0.011)	(0.017)
Observations	1,130	1,125	1,123	1,126	1,126	1,126
R-squared	0.219	0.291	0.224	0.240	0.074	0.763

Notes: All models include classroom fixed-effects. Standard errors are clustered at school-level. Robust standard errors in parentheses. ** p<0.01, * p<0.05, + p<0.1

Table A2. Balance test on the baseline variables for the sample of those students included in the Literature model in Figure 2.

	(1) Grammar grade	(2) Literature grade	(3) Math grade	(4) GPA	(5) Female	(6) Age
Treated	-0.022	-0.022	-0.045	-0.050	-0.025	-0.038
	(0.054)	(0.053)	(0.062)	(0.058)	(0.024)	(0.037)
Constant	3.691**	3.697**	3.520**	3.598**	0.472**	12.171**
	(0.025)	(0.024)	(0.028)	(0.026)	(0.011)	(0.017)
Observations	1,148	1,144	1,140	1,144	1,144	1,144
R-squared	0.295	0.292	0.229	0.244	0.073	0.769

Notes: All models include classroom fixed-effects. Standard errors are clustered at school-level. Robust standard errors in parentheses. ** p<0.01, * p<0.05, + p<0.1.