

The evolution of the relationship between delay of gratification and socioeconomic status during COVID-19-induced online education

TAMÁS KELLER – HUBERT JÁNOS KISS

CERS-IE WP – 2020/49

[November] 2020

<https://www.mtaki.hu/wp-content/uploads/2020/11/CERSIEWP202049.pdf>

CERS-IE Working Papers are circulated to promote discussion and provoke comments, they have not been peer-reviewed.
Any references to discussion papers should clearly state that the paper is preliminary.
Materials published in this series may be subject to further publication.

ABSTRACT

We show the evolution of the delay of gratification (DG) of 951 students aged 10-14 years old during COVID-19-induced home-based online education by exploiting data from two waves of voluntary online surveys. Students with the highest socioeconomic status (SES) experienced a marginally significant absolute increase in DG, opening up a relative advantage between low- and high-SES students. The additional effort that high-SES parents invested due to the flexible home-office arrangements into the control and support of their offspring's learning may have spurred these changes. Students' DG is thus malleable according to the quantity and quality of time parents spend with their children.

JEL codes: C93,D91,I24

Keywords: Delay of gratification; Socioeconomic status; COVID-19 pandemic; Primary school students; Online education

Tamás Keller

Computational Social Science - Research Center for Educational and Network Studies, Centre for Social Sciences. 1097 Budapest, Tóth Kálmán utca 4.

and

Institute of Economics, Centre for Economic and Regional Studies. 1097 Budapest, Tóth Kálmán utca 4.

e-mail: keller.tamas@tk.mta.hu

Hubert János Kiss

Institute of Economics, Centre for Economic and Regional Studies. 1097 Budapest, Tóth Kálmán utca 4.

and

Department of Economics, Corvinus University of Budapest. 1093 Budapest Fővám tér 8.

e-mail: kiss.hubert@krtk.mta.hu

A késleltetett jutalom és a szocioökonómiai háttér közötti kapcsolat alakulása a COVID-19 miatt bevezetett távoktatás alatt

KELLER TAMÁS – KISS HUBERT JÁNOS – SZÁMADÓ SZABOLCS

ÖSSZEFOGLALÓ

Bemutatjuk a késleltetett jutalom kísérletben hozott döntések alakulását 951, 10-14 éves diák példáján keresztül, akik a COVID-19 miatt bevezetett távoktatás során önkéntesen részt vettek egy online felmérés két hullámában. A legmagasabb szocioökonómiai háttérrel rendelkező diákok esetében marginálisan szignifikáns mértékben javult az abszolút teljesítmény a késleltetett jutalom kísérletben, növelve a relatív előnyüket a rossz szocioökonómiai háttérrel rendelkező diákokkal szemben. Ezen változások mögött az állhat, hogy a magas szocioökonómiai háttérű szülők a home office-nak köszönhetően több energiát fektethettek abba, hogy a gyermekeik tanulását felügyeljék és támogassák. Úgy tűnik, hogy a diákok késleltetett jutalom kísérletben hozott döntései alakíthatóak, a szülőkkel töltött idő mennyiségének és minőségének a függvényében.

JEL: C93,D91,I24

Kulcsszavak: Késleltetett jutalom, szocioökonómiai háttér, COVID-19 járvány, általános iskolai diákok, online tanulás

The evolution of the relationship between delay of gratification and socioeconomic status during COVID-19-induced online education

Tamás Keller^{1,2,3*}

<https://orcid.org/0000-0001-6943-0955>

Hubert János Kiss^{2,4}

<https://orcid.org/0000-0003-3666-9331>

- ¹ Computational Social Science - Research Center for Educational and Network Studies, Centre for Social Sciences
- ² Institute of Economics, Centre for Economic and Regional Studies
- ³ TÁRKI Social Research Institute, Budapest
- ⁴ Corvinus University of Budapest
- * Corresponding author

Address

Tóth Kálmán utca 4
Budapest
1097 Hungary
keller.tamas@tk.mta.hu

Author contributions: T.K. and H.J.K conceived the idea; T.K.collected the data; T.K.analyzed the data; T.K.made the figures and tables; T.K. and H.J.K. wrote the paper.

Funding: T.K and H.J.K acknowledge support from the Institute of Economics's internal grant that supported innovative research ideas during the COVID-19 epidemic. T.K. acknowledges support from the Hungarian National Research, Development and Innovation Office NKFIH (grant number FK 125358). H.J.K. acknowledges support from the Hungarian National Research, Development and Innovation Office NKFIH (grant number K 119683).

Ethics: Research was approved by the Ethics Review Committee of the Centre for Social Sciences (TK CSS). We confirm that all methods were carried out in accordance with relevant guidelines and regulations.

Abstract

We show the evolution of the delay of gratification (DG) of 951 students aged 10-14 years old during COVID-19-induced home-based online education by exploiting data from two waves of voluntary online surveys. Students with the highest socioeconomic status (SES) experienced a marginally significant absolute increase in DG, opening up a relative advantage between low- and high-SES students. The additional effort that high-SES parents invested due to the flexible home-office arrangements into the control and support of their offspring's learning may have spurred these changes. Students' DG is thus malleable according to the quantity and quality of time parents spend with their children.

Keywords

Delay of gratification; Socioeconomic status; COVID-19 pandemic; Primary school students; Online education

JEL codes

C93, D91, I24

Highlights

- Focus on students' delay of gratification (DG) and socioeconomic status (SES)
- Observation of DG twice in ca. 30-day period during COVID-induced online education
- Finding that high-SES students' DG increased, opening a relative SES-induced gap
- Students' online education benefitted from parental effort through home-office
- Students' DG is malleable according to time parents spend with children.

Introduction

We describe the short-term effect of the COVID-19-induced shift to home-based online education on primary school students' delay of gratification (DG), with a focus on socioeconomic status (SES) differences.

DG is an aspect of time preference, often referred to as patience or self-control. Children with the ability to delay gratification enjoy numerous favorable outcomes later in life, including better school performance and health and higher lifetime income (Mischel et al., 1989). Higher SES induces systematically different parenting environments that spur students' DG predominantly through parental time with children (Deckers et al., 2015).

COVID-19 has had a profound impact on many aspects of life. On the one hand, it has led to school closures: here, low-SES families coped less efficiently with the extra burden of home-based online education than prosperous families (Bacher-Hicks et al., 2020), potentially diminishing students' DG. On the other hand, COVID-19 has induced a more intensive shift to home-working, especially among high-SES families (Gaudecker et al., 2020), increasing the time parents spent with offspring.

We argue that students needed self-control related to time-management (an aspect of DG) to fulfill the requirements of online education. The transition from classroom-based education to home-based online education meant that students lacked a controlled school-based learning-environment. This required additional parental effort related to providing them with the necessary learning environment, which manifests in parental control and support.

Working from home was more prevalent among high-SES families during the pandemic, and such families supervised their children's homeschooling more rigorously, increasing DG and opening up a relative gap between the lowest and highest SES students' DG. Our data provide suggestive evidence that supports this argument.

The context of the research and the data

Due to the massive increase in the number of those infected by COVID-19, on March 13, Hungary's prime minister announced a switch to home-based online education from March 16.¹

¹ <https://hungarytoday.hu/hungary-schools-digital-distance-education/>

Online education remained in force until the end of the academic year 2019/2020: a period of 91 days. In practice, however, online learning began in mid-April. In the first two weeks, schools had difficulty providing online education. When families and schools became accustomed to the new circumstances, the eight-day long spring break interrupted or further postponed the switch.

We collected data through two consecutive online surveys among 10-14-year-old students in 28 rural Hungarian primary schools and 126 classrooms in grade-levels 4 to 8. Our sample is not representative of the corresponding school population, and the performance of students in the participating schools was ca. 0.2 standard deviations below the national average for math and reading-comprehension tests.

Students' participation in online surveys was voluntary, resulting in an average response rate of 60%. We began the first wave of data collection (W1) 32 days after students switched to home-based digital education. The median response in W1 occurred on the thirty-ninth day of digital education. Thus, most students' answers relate to the first half of the online education period (for the number of responses per day in W1 and W2, respectively, see Figure 1, upper chart).

We opened the second wave of data collection (W2) eight days after closing W1. For median students, 32 days elapsed between W1 and W2 (ranging between 12 and 48 days), enabling us to observe changes in a relatively short period (for the examined period between W1 and W2 per student, see Figure 1, lower chart).

During W1 and W2, students could fill in the online questionnaire flexibly, resulting in two kinds of variation. First, variation exists regarding when we first observed students. Second, the number of days that elapsed between W1 and W2 (i.e. the period covered by home-based online education) is not uniform between students.

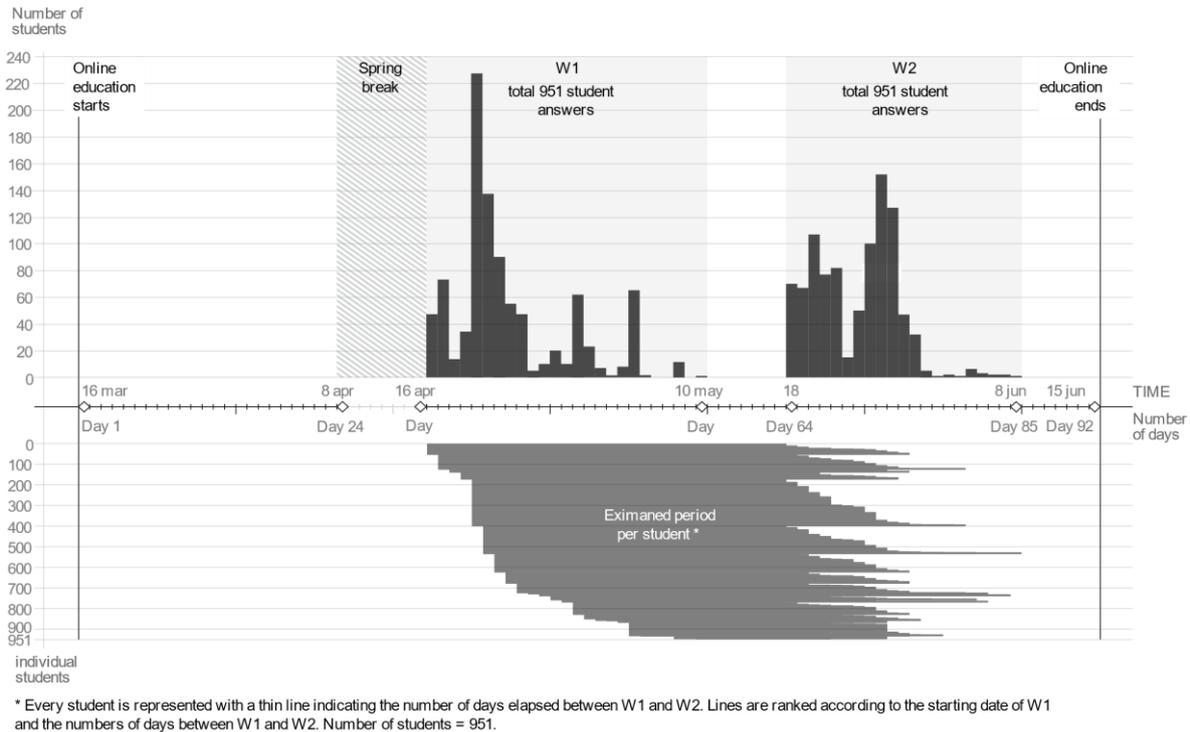


Figure 1: Number of responses per day in W1 and W2 respectively (upper charts) and the period per student between W1 and W2 (lower chart)

By comparing data in W1 and W2, we exploit having two observations from the same students. We eliminate all individual differences that are constant over time – including variation between students concerning the start of W1 and elapsed time between W1 and W2 by deploying student-fixed-effects in our estimations.

Our outcome variable is students' DG. We measured DG in a hypothetical choice-situation (without real incentives). We asked the following question *“You can see colorful wristbands in the picture below. Imagine you could choose from these wristbands. The number of wristbands you can choose depends on when you would like to receive them. If you would like to receive them today, then you can choose one wristband. If, however, you wait until tomorrow, you can choose two wristbands.”* A similar measurement of DG was proposed by Mischel (1974).

We measured students' SES by the following question before the school closures: *“How many books do you have? You should count the number of books you and your parents possess together. Please do not include your coursebooks and newspapers.”* This question is a standard one in nationwide surveys.

Changes in DG during Covid-19

Figure 2 shows the share of students who opted for two wristbands (DG) in each category of the variable: “Number of books at home” (SES). In W1, the relationship between SES and DG is not linear, but rather an inverted U-shape, peaking in DG in the mid-range of SES. The relationship between SES and DG is closer to linear in W2.

Between W1 and W2, DG marginally increases by 7.5 percentage-points ($p=0.082$) among high-SES students and decreases (but not significantly) by 5.6 percentage-points ($p=0.154$) among low-SES students.² Since the standard deviation (SD) of DG is 0.39 in W2, these absolute changes are meaningful.

The classroom-fixed-effect regression results corroborate the relative SES-induced differences in DG visible in the graphical representation of raw data. Relative to the lowest SES-category (Book<50), middle-SES students (Book=300) have higher DG of 11.5 percentage points ($p=0.008$) in W1 (Column 1, Table 1), but the highest SES students’ DG (Book>1000) statistically does not differ ($p=0.893$). Social differences in DG emerged between low and high SES students in W2. For example, relative to the lowest SES category, the highest SES students have 12.9 percentage points higher DG ($p=0.035$) in W2 (Column 2, Table 1).

² Without conditioning on SES, DG does not change between W1 and W2 (diff=0.05, $p=0.77$).

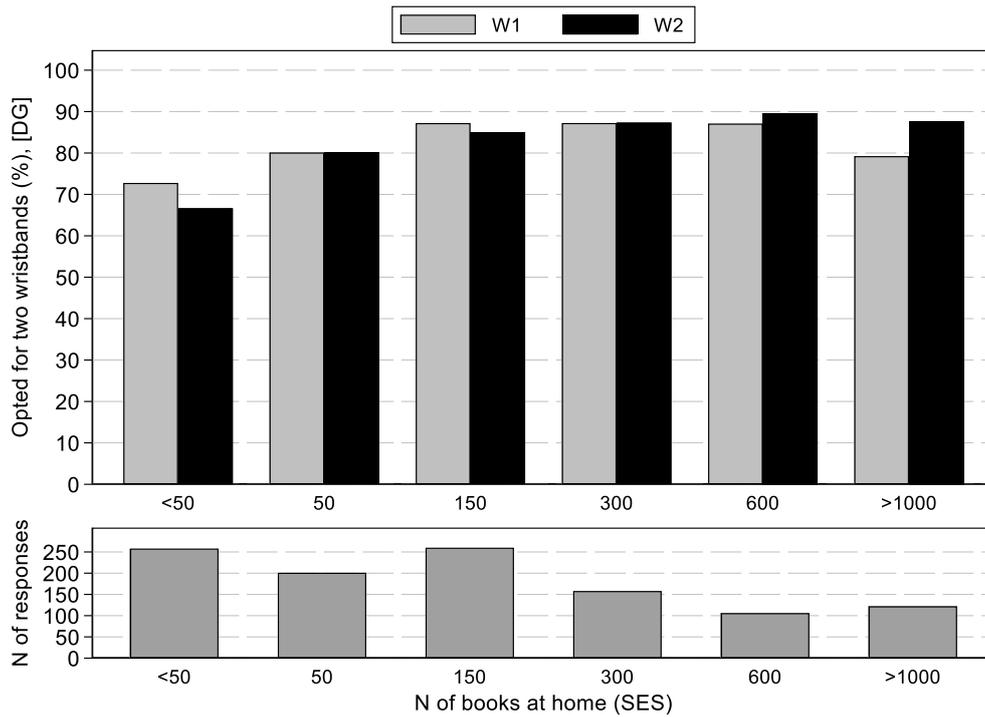


Figure 2.: The raw relationship between SES and DG in W1 and W2 (top) and the number of responses in each SES category (bottom).

Relative SES differences intensified between W1 and W2, as the student-fixed-effect linear (Column 3) and logit (Column 4) models show. For example, the relative difference in DG between the lowest-SES category (Book<50) and the highest-SES category (Book>1000) increased by 13.2 percentage points ($p = 0.028$) between W1 and W2. The conditional logit model supports the result qualitatively but shows different p-values for the change in the SES-gradient ($p = 0.003$ in Book>1000). The induced relative difference between low/high-SES students is large; 34% of the SD of the pooled DG.

Table 1.: Relative SES-related-differences in the level (Column 1-2) and change (Column 3-4) of DG

	(1) ^a W1	(2) ^a W2	(3) ^b W1/W2	(4) ^c W1/W2
Book <50	Ref.	Ref.	Ref.	Ref.
Book = 50	0.037 (0.050)	0.105* (0.041)	0.074 (0.055)	0.916+ (0.530)
Book = 150	0.101* (0.044)	0.136* (0.053)	0.034 (0.050)	0.279 (0.502)
Book = 300	0.115** (0.040)	0.154** (0.054)	0.056 (0.055)	0.654 (0.724)
Book = 600	0.092+ (0.050)	0.148* (0.059)	0.067 (0.054)	0.942 (0.825)
Book >1000	0.008 (0.056)	0.129* (0.058)	0.132* (0.059)	2.263** (0.755)
Observations	951	951	1,902	1,902

All models include constants

Robust standard errors in parentheses, ** p<0.01, * p<0.05, + p<0.1

^a The coefficients in each category refer to the difference in the level of DG relative to the reference category (Book <50) and are obtained from a linear probability model. The models include classroom-effects. Standard errors are clustered at the school level.

^b The coefficients in each category refer to the change in DG between W1 and W2 relative to the reference category (Book <50) and are obtained from a linear probability model. The model includes student-fixed effects. Standard errors are clustered at the classroom level.

^c Logit coefficients were obtained from a conditional (fixed-effects) logistic regression. The coefficients in each category refer to the change in DG between W1 and W2 relative to the reference category (Book <50). The model includes student-fixed effects. Standard errors are clustered at the classroom level.

Conclusions

We observed the evolution of primary school students' DG during the COVID-19-induced switch from classroom-based to home-based online education, focusing on socioeconomic differences. We exploited having two observations about 951 students in 126 classrooms from 28 rural Hungarian primary schools, and performed student-fixed-effect estimations. We found that the highest SES students experienced a marginally significant absolute increase in DG (7.5 percentage point) and a 13.2 percentage relative gain compared to the lowest SES-students during a relatively short (30-day) interval. These are substantial changes relative to the SD in DG.

Our results are conservative estimations for two reasons. First, our first measurement of students' DG occurred during (not before) the switch to online education. Thus, we likely underestimated the entire change in students' DG during online education. Second, students may have aimed to be consistent in their answers – they might have remembered in W2 how they had answered the same DG-question in W1 due to the short time between the two waves,

and anchored their later answer to the prior one. Accordingly, we are likely observe no change in DG although it changed.

We argue that COVID-19-induced online education required parental effort to maintain students' learning environments since students needed external control and support. However, COVID-19 might have changed the availability of high-SES parents for their children. The latter parents are usually absent from home due to intensive workloads but can become more available for their children due to home-office arrangements than low-SES parents. The extra control and support of high-SES parents was translated into their offspring's relative advantage over low-SES peers. This relative difference was not visible in students' DG before online education.

In sum, our results suggest that the DG of students aged 10-14 is malleable, in line with (Alan & Ertac, 2018). The quantity and quality of time parents spend with their children facilitating their learning spurs students' ability to delay gratification - a message that parents, teachers, and employers should remember once the horror of COVID-19 is over.

References

- Alan, S., & Ertac, S. (2018). Fostering patience in the classroom: Results from randomized educational intervention. *Journal of Political Economy*, 126(5), 1865–1911.
- Bacher-Hicks, A., Goodman, J., & Mulhern, C. (2020). Inequality in Household Adaptation to Schooling Shocks: Covid-Induced Online Learning Engagement in Real Time. *National Bureau of Economic Research Working Paper Series*, 27555.
- Deckers, T., Falk, A., Kosse, F., & Schildberg-Hörisch, H. (2015). How Does Socio-Economic Status Shape a Child's Personality? *IZA Discussion Papers*, 8977, 1–37.
- Gaudecker, H.-M., Holler, R., Janys, L., Siflinger, B., & Zimpelmann, C. (2020). Labour Supply in the Early Stages of the COVID-19 Pandemic: Empirical Evidence on Hours, Home Office, and Expectations. *IZA Discussion Paper*, 13158.
- Mischel, W. (1974). Process in delay of gratification. In L. Berkowitz (Ed.), *Advances in experimental social psychology*. Academic Press.
- Mischel, W., Shoda, Y., & Rodriguez, M. L. (1989). Delay of Gratification in Children. *Science*, 244(4907), 933–938.